Validation of Construct Vocational Literacy: An Analysis of the Suitability of the Needs of SMK Students in Indonesia

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Abstract. The purpose of developing vocational literacy is to achieve vocational graduates' skill competencies that are integrated into learning to face the workplace. Vocational literacy is a person's ability to process and understand the knowledge and development of the vocational field. The previous study has synthesized a vocational literacy construct that has been valid according to linguists, an expert in instruments and assessments, and vocational education. This study intends to validate the concept for SMK students in Indonesia. The study is descriptive analysis with a survey approach to determine students' reactions to the existence of a vocational literacy concept with the dimensions and the four measuring indicators. The validation survey contains statements related to the dimension of context, mastery of knowledge, competence, and scientific attitudes and, four indicators which are work preparation, response to technology, communication and collaboration. The instrument used is a modified Likert scale (1–5) accompanied by a qualitative response from each student with descriptive narrative data analysis techniques. Respondents in this study were 2200 vocational students in all skill programs throughout Indonesia. The final result of this paper is the development of a vocational concept that is relevant to the needs of vocational students throughout Indonesia. The results of the analysis using the JASP software show that the average goodness of fit (GOF) model is acceptable, with a value of RMSEA = 0.070, (good fit) CFI = 0.949 (good fit), GFI = 0.929 (good fit), NFI = .910, (good fit), IFI = 0.949, (good fit), TLI = 0.938 (marginal fit) and chi-square with p-values <.001 (bad fit) which in the instrument and the model as a whole must be reviewed and fine-tuned. Then the results of the loading analysis show the estimated factor load value of 0.561–0.716 and the p-value shows <0.001 which means that each instrument item that represents the indicator has been significant and contributed to measuring each dimension. The construct of vocational literacy in the previous research has been valid based on the results of the confirmatory factor analysis between the concept and the needs of vocational students in all areas of expertise throughout Indonesia.

Keywords: Vocational Literacy · Validation · Vocational Student · TVET

1 Introduction

Literacy which was previously interpreted simply as the ability to read and write [1], is now literacy more deeply interpreted as the ability to recognize information needs,

obtain it through various appropriate sources, process and use it effectively as a problem-solving solution and the ability to communicate it (Polcyn & Gawrysiak, 2019; Reiska et al., 2015). Solving the concept of literacy is also carried out by many researchers to harmonize concepts in certain fields such as scientific literacy in the field of general education. [4], digital literacy in the field of technology and information [5], financial literacy in economics (Twumasi et al., 2022), to cultural literacy [7], and others. However, in vocational education, the discussion about literacy is not interpreted broadly and tends to be equated with scientific literacy in general education [8]. However, they both have different characteristics. If scientific literacy in general education is more oriented toward science, while in vocational education literacy is more likely to be interpreted as applicative, suppressing application-based learning [9, 10]. To qualify of the industrial world, a graduate of vocational education not only masters basic scientific knowledge, but also how to apply knowledge, as well as communication and collaboration skills with fellow workers both in one area of expertise and in different fields of expertise [3, 11–14]. This thinking is indeed in line with scientific literacy skills, but it requires refinement of the concept so that it is in line with the objectives of vocational education. In previous research, a vocational literacy concept has been synthesized which is structured as a measuring tool for a graduate's ability to master knowledge, the process of achieving certain competencies in the vocational domain, professional attitudes, communication and collaboration skills, and career planning (Linnakylä, 1991; Parkinson & Mackay, 2016). Vocational literacy has a construct consisting of 4 dimensions, namely the context of knowledge, mastery of knowledge, achievement of competence and scientific attitude. In each dimension, 4 indicators are developed, namely work preparation, response to technology, communication and collaborative collaboration (Maulana et al., 2021). In its implementation, a valid and more mature vocational literacy construct to be used still needs to be adapted to the actual needs of students, therefore the authors analyze of the suitability of the concept with student needs based on the results of a survey that has been conducted on vocational students of all skill programs throughout Indonesia.

2   Method

This study is an analytical descriptive study intended to test the validity using construct validity (Muharam Heluth, 2013; Rismawati & Khairiati, 2020; Sulistiawan et al., 2018). Construct validity is intended to determine the extent to which the measurement results can reflect the theoretical construction that has been synthesized with the situation of needs in the field (Albrecht et al., 2022).

2.1   Population and Sample

The survey subjects in this study were 2200 SMK students in all skill programs throughout Indonesia.

2.2   Research Tool

The research approach used is a survey approach (Benjamin et al., 2017; Damayanti, 2018; Obiosa, 2020) with a *cross-sectional method* that is carried out once at the same

Table 1. Criteria for *Goodness of Fit* for vocational literacy constructs

Criteria	Acceptance Rate	Interpretation (Model *fit*)
Chi-square Significance	p > 0.05	p > 0.05
RMSEA	<0.05 or <0.08	>0.05
CFI, GFI, NNFI, NFI, IFI	0 (not fit) - 1 (fit)	0.90 _
TLI	0 (not fit) - 1 (fit)	0.95 _

[36]

time (Klotz et al., 2015). The steps of research are: (1) The preparation step, requesting a survey permit, compiling an assessment instrument or questionnaire (2) The implementation step, conducting research and collecting survey data, (3) The completion step, in the form of data analysis of survey results (Rohr-Mentele & Forster-Heinzer, 2021). The data collection technique used is *simple random sampling* or random and simple sampling (Pionera et al., 2020; Sandjaja et al., 2020). The data obtained are qualitative data (Broom, 2021; Nurbaiti, 2020) sourced from instruments compiled based on the vocational literacy construct with 4 dimensions and 16 indicators. There are 16 statements were tested on a Likert scale of 1–5 to describe the level of agreement, ranging from strongly disagree to strongly agree (Arnulf et al., 2018).

2.3 Data Analysis

Obtained data were analyzed using CFA (Confirmatory Factor Analysis) which tested whether the size of the construct was consistent with the model that had been synthesized. (Long et al., 2020; Meade & Kroustalis, 2006; Nam & Eack, 2012; Scullen, 1999). The results of the analysis were obtained through the JASP instant computer program (Kumalasari et al., 2020) to describe observation variables (indicator variables) which in this case are vocational literacy indicators as elements that reflect the needs of vocational students, and can define latent variables in the form of the main dimensions of vocational literacy. The test criteria for the validity of the vocational literacy construct were determined based on the following *Goodness of Fit* (GOF) Table 1 (Francis et al., 2020).

3 Result and Discussion

3.1 Result

The results of the confirmatory factor analysis that have been carried out through the JASP instant computer program with a total of 2200 respondents indicate that the average *goodness of fit* (GOF) model is acceptable. Some of the fit criteria include root mean square residual (RMSEA = 0.070, good fit) comparative fit index (CFI = 0.949, good fit), goodness of fit index (GFI = 0.929, good fit), normed fit index (NFI = 0.910, good fit), Bollen's Incremental Fit Index (IFI = 0.949, good fit), while the Tucker-Lewis Index (TLI) is in a marginal fit position with a score of 0.938 and the chi-square (p-values

Table 2. Fit Indices

Index	Value	Description
Chi-square (p-value)	<0.001	Bad Fit
Root mean square error of approximation (RMSEA)	0.070	Good Fit
Comparative Fit Index (CFI)	0.949	Good Fit
Goodness of fit index (GFI)	0.929	Good Fit
Bentler-Bonett Non-normed Fit Index (NNFI)	0.938	Good Fit
Bentler-Bonett Normed Fit Index (NFI)	0.945	Good Fit
Bollen's Incremental Fit Index (IFI)	0.949	Good Fit
Tucker-Lewis Index (TLI)	0.938	Marginal Fit

<.001) belongs to bad fit category because the p-values category is strongly influenced by the number of samples used (Sudarmika et al., 2020). Overall, the fit model is acceptable but is not a fit model that is included in the very good category, so it needs to be refined. The results of the fit criteria obtained from the JASP calculation can be seen in Table 2.

After testing the *goodness of fit,* if the next step is to test the construct validity based on the loading factor value. The loading factor limit is 0.5. If the loading factor value >0.5 then convergent validity is met, but the loading factor value <0.5 then the validity value has not been met so the construct must be replaced and repaired (Francis et al., 2020). The results of the construct validity test show that all items in the vocational literacy construct have an estimated factor load value of 0.561 – 0.716 and the p-value shows <0.001 which means that each instrument item that represents the indicator has been significant and contributed to measuring each dimension. The results of the test of the validity of the vocational literacy construct based on factor loading can be seen in Table 3 and the model that has been described in the JASP analysis tool in Fig. 1.

3.2   Discussion

The model has been validated and can be accepted with confirmatory factor analysis for the *goodness of fit* (GOF) category is a vocational literacy construct that has been compiled in previous research consisting of 4 dimensions and 16 indicators. (Maulana et al., 2021). Even though the model is fit and acceptable, the model isn't included in the very good category, so improvements are needed on the dimensions and the constituent indicators [38]. The following is a framework for the theoretical model of vocational literacy that will be analyzed more deeply on the dimensions and the four derivative indicators (Fig. 2).

Dimensions 1
The first item of the instrument represents the work preparation indicator (A1) on the context of the vocational dimension, namely "knowing the basics of majors (vocational science) from various sources". That Instrument point is used to measure graduated basic knowledge of vocational or job title as one of preparation to face world of work.

Table 3. Factor loadings

Dimension	Indicator	Symbol	Estimate	Std. Error	z-value	p	95% Confidence Interval		Std. Est. (all)
							Lower	Upper	
Dimensions 1	1. (A1)	11	0.589	0.016	36,634	<.001	0.558	0.621	0.713
(Context	2. (A2)	12	0.561	0.018	31.026	<.001	0.525	0.596	0.627
of Vocational)	3. (A3)	13	0.620	0.017	37,367	<.001	0.587	0.652	0.724
	4. (A4)	14	0.636	0.017	37,830	<.001	0.603	0.669	0.730
Dimensions 2	5. (B1)	21	0.626	0.015	41,353	<.001	0.597	0.656	0.771
(Mastery	6. (B2)	22	0.654	0.016	41,254	<.001	0.623	0.685	0.769
of Vocational	7. (B3)	23	0.622	0.015	41,155	<.001	0.593	0.652	0.768
knowledge)	8. (B4)	24	0.562	0.016	34,267	<.001	0.530	0.594	0.671
Dimensions 3	9. (C1)	31	0.604	0.015	39,659	<.001	0.574	0.634	0.742
(Process to	10. (C2)	32	0.659	0.015	42,935	<.001	0.629	0.689	0.784
competence)	11. (C3)	33	0.699	0.016	42,770	<.001	0.667	0.732	0.782
	12. (C4)	34	0.659	0.016	41,446	<.001	0.628	0.690	0.765
Dimensions 4	13. (D1)	41	0.595	0.016	37,208	<.001	0.563	0.626	0.709
(Work	14. (D2)	42	0.622	0.015	41,401	<.001	0.592	0.651	0.766
attitude)	15. (D3)	43	0.716	0.017	41.090	<.001	0.682	0.751	0.762
	16. (D4)	44	0.708	0.017	42,192	<.001	0.675	0.741	0.776

Based on the results of the loading factor analysis that has been mentioned in Table 3, show a significant result, that is 0.589. It can be interpreted that through various sources, basic vocational knowledge can be obtained by students as initial preparation for the world of work [39]. The context of knowledge is fundamental in the learning process (Butler & Brooker, 1998). Without analyzing and describing the context, learning will not be understood, because the context will determine what and how knowledge is mastered [41]. Based on the comments of several respondents, the average respondent agrees that the basics of the majors must be known from various sources from an early age so that there is no misconception between goals and the process of achieving them.

The second item of the instrument, that is "From various sources, it is known that other majors (vocational sciences) related to my major". That instrument is used to measure up to date knowledge about latest technology device for supporting mastery of vocational knowledge. It has loading factor value is quite significant in representing the response indicator to the latest technology (A2), which is 0.561. However, the second item is the item that has the lowest factor loading value among the other items, because the statement on the instrument doesn't explain enough about technology, so it does not
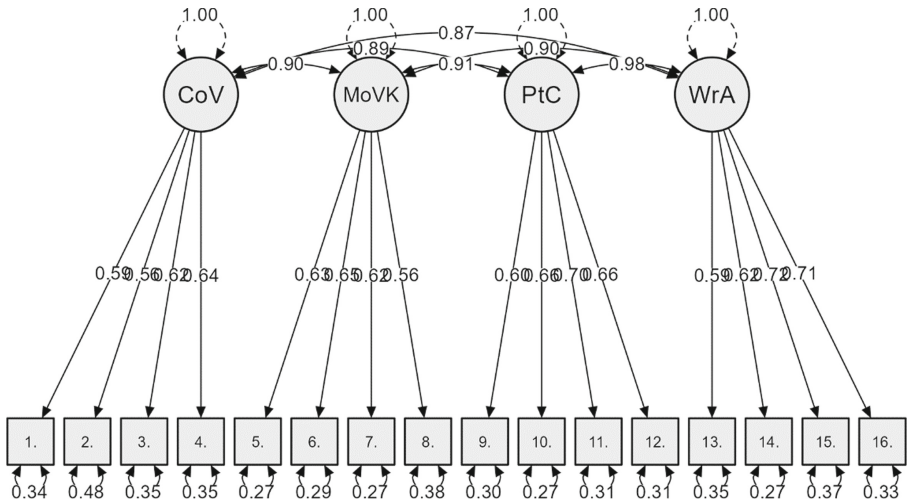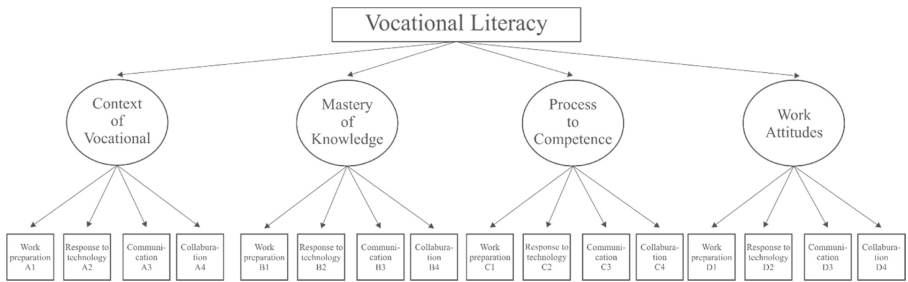
Fig. 1. Plot models

Fig. 2. Theoretical Model of Vocational Literacy

measure the role of various sources and the latest technology used by students to know the basic vocational knowledge they have. Then based on the comments, a lot of respondents agreed and stated that after basic vocational knowledge was obtained, Information Media and Technology Skills were needed to find out the relationship between one field of expertise and another. [42]. Information and communication technology literacy skills are needed so that students can analyze various information media that are suitable for establishing communication [43].

The third item of the instrument, that is "From various sources, it is known that the relevant work network with my current department (vocational science)" defines the need for a communication indicator (A3) to find out related vocational fields and relevant networks. In the calculation of the loading factor, the figure obtained by the third item is 0.620 which shows a high significance. Based on the comments of respondents, on average they agree with the statement in point 3, networking is very necessary, therefore it is necessary to know by communicating through various sources and technology. Reinforced by the opinion of Piva (2011) building a work network is a process

of establishing communication or relationships, exchanging information and resources based on trust and mutual benefit between partnering parties as outlined in the concept of working together.

The fourth item of the instrument is "from various sources, it is known that various parties will collaborate/collaborate with my (vocational science) department". The main focus of this item is knowing with whom to collaborate (A4). Collaboration is a form of cooperation or interaction between several different elements related parties such as individuals, institutions and parties directly involved or indirectly who receive the consequences and benefits [45]. Based on the calculation of the loading factor, it shows a high significance, which is 0.636 and based on the respondents' comments, most of them also explain the importance of knowledge about collaboration before work. As well as forming their respective responsibilities on the part that is done even in a unified collaboration with other areas of expertise [46].

Dimensions 2

The fifth instrument item in this second dimension represents the work preparation (B1) indicator in the mastery of vocational knowledge dimension, that is "through various sources, the basic scientific knowledge can be mastered". That instrument point talk about how the basic vocational knowledge that are occupied is mastered. Based on the analysis, the loading factor value is 0.626, which means the item is significant. This is also evidenced by the comments of respondents who agree that before moving on to deeper knowledge, the basics of knowledge must be mastered first so that later students can make structured analyzes related to what sub-skills must be occupied to achieve the basics of mastery in their field. [40]. For example, respondents from various regions who already know the field of expertise that are following the needs of their region, then deepen the skills they are engaged in. [47].

The sixth item of the instrument describe Mastery basic vocational knowledge that was studied on vocational field which is Practiced as preparation to face world of work. That is "through various sources, I can master the latest technology related to majors (vocational science)" representing the response to technology (B2) indicator in the mastery of vocational knowledge dimension which has a significant loading factor value as well, that is 0.654. This means that these indicators are sufficient to contribute to measuring students' readiness to use technology to master the skills or sub-skills that are occupied [48]. Respondents' comments also added to the reinforcement, as evidenced by several respondents or students who had started to master the technological novelty of information in their field theoretically and carried out simple practices on software that was currently being used, such as in the field of modeling design expertise and building information, which on average stated that they were familiar in various fields. Drawing software such as AutoCAD, Sketch-Up, Excel and others. In the field of business and management expertise, he also stated that he was familiar with software for making financial reports, trial balances and so on. This also applies to other areas of expertise such as Information and Communication Technology, Tourism, Maritime Affairs, health and social work as well as arts and creative industries that not only utilize digital technology but also machine technology.

The seventh item of the instrument represents the communication (B3) indicator in the mastery of vocational knowledge dimension, that is "Mastery of the (vocational)

knowledge that is occupied, I can communicate to colleagues in the majors". This item describes the condition of students' knowledge in more depth about how to communicate and recruit others to join a collaboration. In the loading factor value, it has been seen that the item is significant with a value of 0.622, then also seen from the respondents' comments, it can be concluded that the item is accepted as evidenced by a statement of the agreement and a description of communication which is a transfer of information or message delivery by one individual to another [35, 49]. Then, the benefits of communicating in addition to establishing cooperation, and increasing social interaction, can also share knowledge, such as when one student can master his knowledge then he can also communicate with his friends who do not understand. In addition, the importance of communication is proven by the creation of work networks involving two or more areas of the same or different expertise [11].

The eighth item of the instrument, "I can work with friends in the same major (vocational) class" is an item that is closely related to the third point, that is after communication, collaboration, or cooperation a possibility can happen. The collaboration indicator (B4) on the mastery of vocational knowledge dimension describes how students' ability to analyze the planning targets of people who will and can to collaborate in the same or different fields. The results of the loading factor calculation show the number 0.562 which indicates the item is quite significant. Then from the comments, there are also supporting arguments that the collaboration process is something that makes work easier and more efficient [50]. Many of the respondents also know what areas of expertise are cognate and appropriate to collaborate, for example in the field of expertise in hospitality tourism, in which there are several departments (Front Office Department, Food and Beverage Department, Housekeeping Department, Accounting Department, Personnel/HRD Department, Engineering). Department, Marketing Department, Purchasing Department) which is placed in one work environment, namely the hotel, can form a collaboration in work.

Dimensions 3

The ninth item of the instrument represents the *work preparation* (C1) indicator on the *process to competence dimension,* that is "having competence (minimum ability/skills) from the current (vocational) knowledge". That instrument measure how far the special expertise competence has been possessed by a graduate of vocational education. Based on the results of the *loading factor analysis* in Table 3, a significant result of 0.604 was obtained. This means that to face the world of work, students should have to master the special/typical skills according to their vocational field. [51]. Skills or competencies are used as sub-components for making up positions in each job in an organization or company [47]. Then based on the results of the respondents' comments it was found that the average respondent agreed, as evidenced by the statement that they, especially those in the field of technology and engineering expertise, we're able to draw building plans, then in the field of artistic expertise and the creative industry they could draw clothing patterns, and in the fields of their health and social work skills can mix medicines according to the given prescription.

The tenth item of the instrument is "having competence in using the latest technology from the current vocational field" which is the embodiment of the *response to technology* (C2) indicator item in the *process to competence dimension.* That instrument

point discusses about latest technology for supporting the process of achieving special competencies possessed by students. Then the significance value of the *loading factor* obtained is quite high at 0.659, which means that students admit that they already have the expertise/skills in using the latest technology in their vocational fields such as the use of computer software, machines, internet and others. Adaptability in technological developments in the era of globalization is important in competition in the world of work [52]. This is supported by the comments of respondents, the majority of whom agreed that mastery of the latest technology is needed, such as the competency of modeling design skills and building information which has now shifted from manual drawing to using software such as AutoCAD and SketchUp.

The eleventh item of the instrument describe how the graduate are be able to promote Themselves or they have a special role on their world of work. That is "capable of communicating competence to the wider community" which is a description of the communication indicator item (C3) in the process to competence dimension which has a significant loading factor value that is 0.699. These states explain a student will be able and accustomed to communicating, especially when expressing ideas and opinions about his potential and ability to work with other people and a wider audience. [52]. Then this is supported by various comments given by respondents, on average, they say they agree that communication is a very needed competency, especially in explaining work in the vocational field they are engaged in, and how they accept or reject a job if it is not following their expertise.

The twelfth instrument item from the *process to competence dimension and the collaboration* indicator (C4) is "being able to collaborate with colleagues from different fields of science (but still related to the scientific/vocational field they are engaged in)".Thia = s instrument representing the ability to work collaboratively to solve problems in the world of work. The *loading factor* table shows a significant value of 0.659 indicating that students can work collaboratively (from various related fields of science) and professionally to solve a work problem. Kusainov (2021) suggests that competence in collaboration includes clearly understanding the roles, responsibilities, and professionalism of oneself and others. Based on the comments, the average respondent agrees that collaboration is very much needed in work and collaboration can be established through collaboration with business and industry players.

Dimensions 4

The thirteenth instrument item of the *work attitude dimension on the work preparation* indicator (D1) is "based on the existing situation and conditions, I am optimistic about the (vocational) major that is currently being pursued (provides good prospects)". The instrument describes the tendency to behave positively towards bright career prospects in the vocational field that is pursued in the future. Table 3. *Loading factor* obtained a significant result of 0.595 which shows the high optimism of students in looking at job prospects according to their vocational fields. Based on the respondents' comments, it was found that the majority in each corridor said they agreed that optimism was something that must be applied before facing the world of work. Then self-confidence with the choice of the field of expertise he is engaged in will also form the spirit in learning and working according to their abilities and desires [54].

The fourteenth item of the instrument on the same dimension and the *response to technology* (D2) indicator are "studying the latest technological advances/developments related to the (vocational) department being occupied" which means showing students' desire to always learn technological novelty and how to implement it as an effort to respond to new developments. Existing technology. The loading factor table shows a significant value is 0.622. According to the survey results, most respondents in each regional corridor agree on the importance of having a desire to always learn about technological advances, which is related to the skills they will acquire to face the world of work. [55]. A lot of respondents also said that although it is difficult, technological developments must still be mastered because, in addition to benefits in work skills, technology also helps the effectiveness, and efficiency of working time [56].

The fifteenth item on the dimensions of *work attitudes and communication* indicators (D3) is "successfully communicating the competencies that are occupied to the wider community" which means students can apply good communication according to the position and vocational field they are engaged in the team. Getting significant *loading factor* value is 0.716 which is the largest value among other items. One of the relationships between attitude and communication is intrapersonal intelligence which involves verbal and non-verbal communication skills, the ability to understand and respond to other people in other fields or networks in the world of vocational education. [57]. Then, according to the analysis of the respondents' comments, an agreeable opinion was obtained, which means that students agree that good communication in a vocational context is needed in the application in the wider community and in the industrial world.

The sixteenth item on the dimensions of *work attitudes and collaboration* indicators (D4) is "successfully collaborating/collaborating with colleagues from other (vocational) majors (related to the vocational field that I am currently pursuing)". This means that students have been able to collaborate with various experts from various majors to carry out professional work reaching a significant value, thats' 0.708. Through the results of the survey, students' opinions were obtained, namely agreeing with the given instrument, this can be interpreted that students tend to form professional collaborations later. The attitude of socializing cannot be separated from collaborating activities, example, many activities are carried out by students or respondents in the form of good collaboration with the community such as community service, as well as collaborating with the industrial world to provide mutually beneficial relationships with each other. The essence of collaboration is also related to the ability to work with other professions to solve and decide on a problem solution, tolerating differences, misunderstandings, and shortcomings of other professions, as well as interdependent relationships with other professions [57, 58].

4 Conclusion

The vocational literacy construct that has been synthesized in previous research is validated by surveying vocational students in all areas of expertise throughout Indonesia. The purpose of the validation is to determine the suitability between the concepts that have been designed and the needs of the world of vocational education in the field. The survey results were analyzed using the JASP instant computer program with the CFA *(Confirmatory Factor Analysis) method.* Produced an average *goodness of fit* (GOF) model acceptable, with a value of RMSEA = 0.070, (good fit) CFI = 0.949 (good fit), GFI = 0.929 (good fit), NFI = .910, (good fit), IFI = 0.949, (good fit). Nevertheless, two criteria that make the construct must be further refined, such as the TLI which is classified as marginal fit worth 0.938 and chi-square (p-values <.001) which is classified as bad fit. Then based on the results of the loading factor analysis that has been mentioned in Table 3, it shows that all items in the vocational literacy construct have an estimated factor load value of 0.561–0.716 and the p-value shows <0.001 which means that each item of the instrument that represents the indicator has been significant and contributed to measuring each dimension. The first dimension is related to mastery of the basics of vocational science needed in terms of job preparation, response to technology, building networks with communication and collaboration. The next dimension is mastery of vocational knowledge which has also been confirmed by respondents that after there is knowledge of the basics, there must be an effort to explore these basic concepts both in terms of work preparation, response to technology, building networks with communication and collaboration. Then the dimension of the process to competence is how to respond to the knowledge that has been explored, namely by making it a skill that helps prepare for work, respond to technology, build networks with communication and collaboration. The last dimension is that the work attitude acts as a cover, meaning that after a set of knowledge and skills has been possessed, as a complement is the work attitude. A worker who is by industry qualifications has an optimistic attitude, is honest, obeys the rules, is adaptive, and can to socialize to collaborate.

5 Recommendation

This research is continuous research, which requires other studies to improve the results or outcomes. The results of the validation of the vocational literacy construct by CFA *(Confirmatory Factor Analysis)* show that the fit model is acceptable and by the analysis of the needs of vocational students. However, this model is not a fit model that is included in the very good category, so it needs to be refined. In this case, the author suggests that further discussion be carried out in the next research regarding the construction of a more perfect vocational literacy.

Authors' Contributions
See Table 4.

Table 4. Authors' Contribution

Name	Task field
Arris Maulana	Develop concepts and models of vocational literacy, Conduct literature reviews, develop validation instruments,
Fina Luthfiyah	Looking for research respondents, collecting survey data, analyzing data, compiling articles
Daryati	Carry out validation surveys, take an inventory of research needs, coordinate the team and research needs
Ryan Arthur	Propose ideas and ideas for vocational literacy, analyze literature, analyze concepts & items of validation instruments, review and revise articles

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