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Research Article

Attitudes of Vocational High School Students in the Field of Chemical Technology towards Production during the Covid-19 Pandemic: A Scale Development Study

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Keywords
Vocational Education, Chemical Technology, Production, Covid-19 Pandemic, Attitude Scale.

Abstract
With the Covid-19 pandemic, the Vocational and Technical Education Institutions affiliated to the Ministry of National Education played a very important role in the production of materials such as masks, gloves, visors, disinfectants, cleaning products, etc., which are the basic needs of the society during the pandemic process. It is thought that the productions made by making the most of the production potential of vocational and technical education institutions have an impact on the attitudes of the students studying in these educational institutions. In this study, it is aimed to develop the Attitude Towards Production Scale (ATPS) in order to determine the opinions of the students studying in the field of Chemical Technology at vocational high schools in our country during the Covid-19 pandemic process. The universe of the research consists of 24 Vocational and Technical Anatolian High School (MTAL) students who produce in the field of Chemical Technology affiliated to the Ministry of Education in the 2021-2022 academic year. The sample of the study consists of 297 students who studied at 14 MTALs, which were determined by using the random sampling method, which is one of the probabilistic sampling methods, and took part in production during the Covid-19 pandemic process. Content validity of the ATPS was provided by expert opinion, and construct validity was provided by exploratory factor analysis (EFA) and structural equation modeling (SEM). For content validity, the 38-item draft scale was submitted to an expert group of 14 people. The construct validity of the ATPS was carried out with the data obtained from a sample of 297 people. EFA showed that ATPS consists of 5 sub-dimensions and 17 items. In the reliability analysis of the ATPS, the Cronbach Alpha coefficient was found to be 0.92. As a result of the study, 17 items whose validity and reliability were ensured in the ATPS were produced.

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1. Introduction

Industrialization is one of the most important elements of economic development in a country. With the ever-increasing population in our country, the goal of being one of the 10 largest economies in the world increases the need for manpower equipped with professional competencies and skills with the advancements in technology in the business world. Vocational and technical education institutions, which are deeply connected with the labor market, have an important role in providing the necessary knowledge and skills and qualified manpower who keep up with the times.[1] This situation is important in terms of the development of vocational education institutions, which are the first door to employment in the business sector, according to the age.

The developing world and the need for manpower necessitated the establishment of a continuous relationship between education and industry partners in shaping the education system and raising the qualified employees needed by the industry with the shaped education system and bringing them into the business sector.[2] In line with this purpose, the Ministry of National Education establishes a coordinated connection with both the public and private sectors.[3] The most important pillar of this connection is vocational education institutions. Because, those who go through vocational training processes within the standards applied by the Ministry of National Education in the training of well-equipped employees that the business sector needs meet this need.

Individuals who graduated from vocational and technical education institutions play an important role in meeting the personnel needs needed in the sector and in ensuring the balance of education and employment.[4] Increasing the importance given to vocational education institutions, eliminating the problems that these institutions encounter or may encounter in the fields of theoretical and applied education are important for the realization and maintenance of the economic stability policy that our country aims for. It is necessary to ensure the continuity of vocational education gains and to be renewed by adapting them to business life. It is expected that these gains will be developed in line with the demands of the business world and the developing technology and integrated into the education system, minimizing the technical incompatibility between the employer and the employee.[5]

During the Covid-19 pandemic, all sectors in life, especially educational institutions, have been seriously affected, and all public and private institutions/organizations have taken some measures to minimize these effects. In this process, all provincial and provincial organizations, especially the central organization affiliated to the Ministry of National Education, took the necessary measures to prevent the disruption of education and training. Vocational education institutions with revolving fund activities affiliated to the Ministry of National Education, disinfectant, cologne, mask, N95 mask, face shield, overalls / apron, surgical mask machine, ventilator, sterilization device, IR temperature needed by the society during the Covid-19 epidemic. It has played a very important role in the production of many products such as meter.[6] During the pandemic process, vocational high schools have shown a great example of responsibility with their production. The value of vocational education institutions has been understood once again with the dedication of the staff and students working in vocational and technical education institutions during the pandemic process. Therefore, it is thought that the productions carried out in this process, where the production performance of the institutions is used at the maximum level, affects the attitudes of the students studying in these institutions. The Ministry of National Education's focus on production-oriented and school-employment-production-based practices in vocational high schools in recent years in the perspective of 2023 Education Vision is important in terms of determining the attitudes of students towards these production activities.

Attitudes can be expressed as a tendency that creates a decisive bias in shaping the behavior of individuals. From this point of view, attitudes play an active role in gaining positive tendencies of individuals.[7] For this reason, it is thought that determining the attitudes of the vocational high school students towards production with this developed scale will contribute to the development of positive attitudes of the students about production, as well as to the detection of negative attitudes, if any, and to produce remedial solutions for them. From this point of view, there is a need to determine and evaluate the attitudes of the students who are educated with vocational education towards vocational education. When the studies in the literature on the determination of the attitudes of the students who receive vocational education are examined, there are very few studies.[3, 8 – 11] No measurement tool has been encountered to determine the attitudes of the students who receive production-oriented education in vocational education institutions. Therefore, in this study presented, it is aimed to develop the Attitude Towards Production Scale (ATPS) in order to determine the opinions of the students studying in the field of Chemical Technology at vocational high schools in our country during the Covid-19 pandemic process. In the student-centered vocational education model, it is important to determine the attitudes of the students in the process, to revise and develop the system. For this reason, it is necessary to present a reliable and valid measurement tool in order to determine the attitudes of the students related to this field towards production. Thanks to this measuring tool, it is possible to talk about a more qualified and efficient production process. Therefore, it is thought that the measurement tool created within the scope of the study will make a significant contribution to all vocational education stakeholders, especially students studying in the field of chemical technology.

2. Experimental Section

2.1. Research Method

The survey method, which is one of the quantitative research methods, was used in the scale development phase of the research. Screening studies; It is a research method used to determine the characteristics of participants such as interests, opinions, attitudes and beliefs about a subject.[12] The universe of the research consists of students who participated in the production during the pandemic process within the scope of 24 Vocational and Technical Anatolian High Schools (MTAL) in the field of Chemistry Technology affiliated to the Ministry of National Education in the 2021-2022 academic year. The sample of the study, on the other hand, consists of 297 students who were selected using the random sampling method, which is one of the probabilistic sampling methods, studying at 14 MTALs and taking part in production during the Covid-19 pandemic period. The sample size was determined according to the formula given below based on the population size.[13]

$$n = \frac{(Nt^2pq)}{(d^2(N-1)+t^2pq)}$$

In the formula;

N: represents number of people in the universe (main mass),

n: represents number of people in the sample,

p: represents the probability of occurrence of the investigated event (0,10),

q: represents probability of not happening of the investigated event (0.90),

d: represents ± sampling error (0.05), accepted according to the incidence of the event,

t: It refers to the theoretical value (1,96) found according to the t table at a certain significance level.

The number of students to be sampled was found to be 284 with the above-mentioned formula at 95% confidence interval. Based on this data, a total of 297 vocational high school students, 150 girls and 147 boys, were included in the study.

2.2. Scope and Limitations

This research was created as a result of the data obtained from 297 students who studied in the field of chemical technology in 14 vocational and technical education institutions affiliated to the Ministry of National Education in the 2021-2022 academic year and took part in production during the pandemic process. For this reason, the research is limited to the opinions of the students who studied in the field of chemical technology in these schools and took part in production during the pandemic process.

2.3. Assumptions

1. In this study, it is assumed that the responses of the students participating in the application to the scale reflect their feelings and thoughts about production.

2. In the study, it is assumed that the sample represents the universe.

3. It is assumed that the students are at a level to be able to respond to the scale items.

4. It was assumed that there was no guiding interaction between the students during the research.

While creating the scale, first of all, literature review was conducted to measure attitude, and the theoretical structure of the attitude (components of attitude: behavior, thought, emotion, as well as the severity of the attitude, the content and expression of the attitude sentences, etc.) were taken into account. Subsequently, the subjects to be mentioned in the scale items were discussed in the interviews held with the teachers working in production at the vocational high school. A literature review was conducted on scale development and vocational education, and attitude scales previously developed for vocational education were also used.[3, 8, 9, 14]

In the research, the students' attitudes towards production, the frequency of taking part in production, the contribution of production to them (positive and negative values) were emphasized. In the light of this information, a 38-item draft of attitude scale towards production was prepared. The scale also included a personal information form containing 5 questions regarding the determination of the demographic characteristics of the students. In order to determine the students' attitudes, a total of 38 5-point Likert-type attitude sentences were included, including "strongly disagree", "do not agree", "undecided", "agree", "totally agree". During the data collection phase, the scale was implemented with a questionnaire created on Google Forms. It was stated on the form that the participation was on a voluntary basis, and the scale was applied to the target audience online. In order to ensure the validity of the ARTS, content validity and construct validity were examined.

2.4. Content Validity

The content validity of a scale depends on the expected attitude of all items in the scale and the extent to which they meet the structure of the examined theme.[15] Field experts can also be used to measure content validity.[16 -18] Spaces were left under all scale items for experts to explain and express their opinions on items with weak content validity and needing correction.

While creating the scale;

1. It was examined by 3 Turkish Language and Literature teachers working in institutions affiliated to the Ministry of National Education for the control of the spelling language,

2. For item analysis, it was examined by 3 lecturers and 1 Assessment and Evaluation specialist who are field experts in the Department of Mathematics and Science Education at ÇOMU Education Faculty,

3. It was examined by 7 Chemistry/Chemical Technology course teachers working in institutions affiliated to the Ministry of National Education.

Accordingly, field experts were asked to state:

1. The intelligibility of the scale language,

2. The suitability of the test for the age group,

3. Whether the test requires expertise,

4. Issues such as the adequacy of the number of items.

The higher validity of a measurement tool increases the level of serving the purpose. While measuring the content validity, the items that should be included in the measurement tool are determined in line with the opinions of the expert group, and the items that need to be corrected are revised, thus ensuring that the measurement tool is free of errors. Criteria used when seeking expert opinion on content validity; validity index (Content Validity Index, CVI) and content validity ratio (Content Validity Ratio, CRV). CVR is recommended for each item in the measurement tool, and CVI is recommended for the use of the measurement tool. In the light of this information, the CVR value qualifies the importance of each item in the test for the measurement, and the CVI value is used to determine the relationship of each item with the scale.[19] In this direction, the content validity of the draft Attitudes Towards Production Scale (ATPS) was carried out by applying the guidelines prepared by Beck and Polit.[20] These steps are; i-preparing the content verification form, ii-selecting a review panel consisting of expert staff, iii-verifying the content, iv-examining the domains and items, v-providing the score for each item, vi- CVR, I-CVI and S- It is the calculation of CVI scores. In addition to these steps, while making the calculations, the CVR value was determined in accordance with the instructions of Ayre and Scally,[19] and the CVI values in the studies of Lynn[21], Beck and Polit.[20] Here, the CVR value is calculated with the equation , $CVR = \frac{A}{N/2} - 1$. Variables in the equation; N represents total number of experts, A; It indicates the number of experts who gave a “relevant (3 or 4 points)” rating. While the number of experts who gave the "relevant" ssessment in the calculation was included in the measurement, the experts who chose the option "must be corrected (2 points)" were asked "What is your suggestion?" was asked as an open-ended question. “Why?” question was posed. In the interpretation of CVR values according to the guidelines of Ayre and Scally,[19] the recommended content validity criterion (CVRcritical=critical CVR) was used for each item that reached a positive value at the $\alpha=0.05$ significance level. As a result of the expert opinion of 14 people, the CVRcritical=critical CVR value recommended by Ayre and Scally[19] is 0.51. While this measurement was being made, it was seen that the opinion of 14 experts was higher than the required critical value for all the items in the form at the $\alpha=0.05$ significance level. In addition, the statistical significance level was calculated separately for each item in the form. The CVR expression, which we come across in the Lawshe technique and which was created by Ayre and Scally,[19] is an experimental phenomenon. In addition, the content validity calculations made by considering the thoughts of Muhamad Saiful Bahri Yusoff have been deepened. The usability level of each item to be used in the scale was determined by the I-CVR measurement. Correlation of expert opinions with each other was calculated with S-CVI values. Muhamad Saiful Bahri Yusoff has two different CVI calculations in the literature.[22] The first is the I-CVI value of the item, which reflects the content validity of each item, and the other is the S-CVI value, which reflects the general content validity of the entire scale. In addition, two different methods are used to determine the S-CVI value. The first of these is the calculation of the S-CVI/Ave value from the I-CVI average of all items. The second is the calculation of the S-CVI/UA value by using the number of experts who gave the "relevant (3 or 4 points)" rating for all items in the scale. S-CVI/UA is accepted as the 'universal consensus index' in the literature. When the literature is examined, it has been stated that the lowest limit of the I-CVI value should be 0.78 in studies based on the opinion of 5 or more experts.[23] When the content validity of the entire scale was examined, it was stated that the S-CVI/Ave and S-CVI/AU values should be 0.8 and above. If the calculated S-CVI/Ave and S-CVI/AU values are above 0.90, the measurement tool is considered "perfect". In line with the calculations, it was observed that the I-CVI value of each item in the ARTS was greater than 0.78. In addition, it was calculated that the S-CVI/Ave measurement value was 0.96 and the S-CVI/AU value was 0.86. In order to take into account the chance factor of agreement between observers in estimating the I-CVI in the measurement results, the scores obtained from the ATPS were converted to kappa values. Kappa index (k*) is a statistical expression that reflects the reliability level of agreement between the opinions of two or more observers.[24] Since the opinions of more than two experts were consulted to determine the content validity, the kappa value was calculated with the kappa sequence suggested by Fleiss.[25] According to Fleiss, kappa series, the values for each of the items in the measurement tool are "Excellent ≥ 0.74", "0.60-0.73 good" "0.40 - 0.59 moderate", "poor ≤ 0, defines it as 39". The equations used to calculate the Kappa value are as follows;

$pc = \left[\frac{N!}{A!(N-A)!}\right] 0{,}5^N$ and $k = \frac{I-CVI-pc}{1-pc}$

Variables used in the calculation;

k; kappa coefficient,

pc; probability of random correlation coefficient, that is, chance fit ratio,

N; number of experts,

A; shows the number of experts who rated 'relevant' and 'rated 3 or 4'.

The 38-item ATPS in the draft scale, which was submitted to the expert opinion, decreased to 36 items after the elimination of 2 items that could not meet the required content validity rate and content validity index criteria as a result of the feedback and calculations. The CRV and CVI values of the scope validity are given in Table 1 below.

Table 1. CRV and CVI values for scope validity

Item	Expert														Score				N_A	I-CVI	UA	CVR	pc $x10^{-3}$	k^*	Voting
	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	4	3	2	1							
Q1	3	4	4	4	4	4	4	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q2	4	4	4	4	4	4	3	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q3	4	4	4	4	3	4	4	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q5	4	3	4	4	4	4	4	4	4	4	3	4	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q6	4	4	4	4	4	4	4	3	4	4	4	3	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q7	4	4	3	4	4	3	4	4	2	4	4	4	4	4	11	2	1		13	0,93	0	0,86	.85	0,97	Excellent
Q8	4	4	3	4	4	3	4	4	2	4	4	4	4	4	11	2	1		13	0,93	0	0,86	.85	0,97	Excellent
Q9	4	3	4	4	4	4	4	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q10	4	4	4	4	4	4	4	4	3	4	4	3	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q11	4	3	4	4	4	4	4	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q12	4	4	3	4	4	4	4	4	4	3	4	4	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q13	4	4	3	4	4	3	4	4	2	4	4	4	4	4	11	2	1		13	0,93	0	0,86	.85	0,97	Excellent
Q14	4	4	3	4	4	4	3	4	4	4	4	4	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q15	4	4	4	4	3	4	4	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q16	4	4	4	4	4	4	3	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q17	4	4	4	4	4	4	4	4	4	4	4	3	3	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q18	4	4	4	4	4	3	4	4	4	3	4	4	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q19	3	4	4	4	4	4	4	3	4	4	3	4	4	4	11	3			14	1,00	1	1,00	.061	1,00	Excellent
Q20	4	4	3	4	4	4	4	4	4	4	4	4	4	3	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q21	4	3	4	4	4	4	4	4	4	3	4	3	4	4	11	3			14	1,00	1	1,00	.061	1,00	Excellent
Q22	4	4	3	4	4	4	4	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q23	4	4	4	4	3	2	4	4	4	4	4	3	4	4	11	2	1		13	0,93	0	0,86	.85	0,97	Excellent
Q24	4	4	3	4	4	4	3	4	4	4	4	4	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q25	4	4	4	4	3	4	4	4	4	4	4	4	4	3	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q26	4	4	4	4	3	4	4	4	4	4	3	4	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q27	4	3	2	4	4	4	4	2	4	2	4	4	4	3	9	2	3		11	0,79	0	0,57	2,22	0,78	Excellent
Q28	4	4	4	4	3	4	4	4	4	4	4	3	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q29	4	4	3	4	4	4	4	3	4	4	4	4	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q30	2	4	2	2	3	4	4	4	4	2	2	2	4	4	7	1	6		8	0,57	0	0,14	18,2	0,48	Weak
Q31	3	4	4	4	4	4	3	4	4	4	4	4	4	4	12	2			14	1,00	1	1,00	.061	1,00	Excellent
Q32	3	4	4	3	4	4	4	4	4	4	4	3	4	4	11	3			14	1,00	1	1,00	.061	1,00	Excellent
Q33	4	4	4	4	3	4	4	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q34	4	2	2	2	4	4	3	4	4	2	2	2	4	4	7	1	6		8	0,57	0	0,14	18,2	0,48	Weak
Q35	4	4	4	4	4	4	4	4	4	4	3	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q36	4	4	4	4	4	4	3	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q37	4	4	3	4	4	4	4	4	4	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Q38	4	4	4	4	4	4	4	4	3	4	4	4	4	4	13	1			14	1,00	1	1,00	.061	1,00	Excellent
Interest ratio	0,95	0,92	0,89	0,92	0,95	0,97	1,0	0,97	0,97	0,89	0,89	0,92	0,95	0,97					S-CVI/UA		.86				
Average proportion of items evaluated as relevant by 14 experts after subtracting 2 items , S-CVI/Ave*															.96										

NA: According to Number of Agreement, Ayre and Scally, there is no item below the value of CVR=CVRcritical (0.571). I-CVI: Item content validity index; PC: probability of random compromise; k: kappa coefficient, evaluation criteria of k*: poor ≤0.39, moderate = 0.40–0.59; good = 0.60–0.73; excellent ≥0.74 according to Fleiss (Fleiss, 1971), S-CVI/Ave* (based on proportion relevance): average proportion of “relevant” scores by experts, S-CVI/Ave (based on I-CVI): all mean I-CVI scores of the items

2.5. Construct Validity

Normality analyzes were performed to ensure the construct validity of the ATPS. In this study, normality analysis was decided by using Skewness and Kurtosis values. As a result of the data obtained as a result of the application carried out with 297 vocational high school students over 36 items, the skewness coefficient was -1,901 ± .141; The kurtosis coefficient was calculated as 1.658 ± .282. It was determined that the statistical values in question were in the range of -2 to +2, and in this context, it was determined that the sample data provided the normality feature.[26]

Table 2 shows the standard deviation, skewness and kurtosis values of the mean of the items in the draft ATPS.

Table 2. Skewness, kurtosis and descriptive analyzes of ATPS

Scale	N	Mean(X)	Standard Deviation	Skewness	Kurtosis
ATPS	297	4,2234	,62393	-1,901	1,658

The construct validity of the draft ATPS was made by factor analysis. The suitability of the data set obtained as a result of the scale for factor analysis can be decided by examining the results of the Kaiser-Meyer-Olkin (KMO) Sampling Adequacy Test (KMO) and Bartlett Sphericity Test.[27] The fact that the KMO value of the sample data was .931 and the Bartlett test value was significant ($\chi 2$=4982,742, df=378, p=.000) shows that the data are suitable for factor analysis. The significance of the Bartlett test of sphericity ($p<0.05$) indicates the suitability of the data for factor analysis. The Kaiser-Meyer-Olkin sample adequacy test also indicates the suitability of the sample size for factor analysis. The acceptable lower limit of the Kaiser-Meyer-Olkin test result is 0.50. The fact that it is greater than 0.90 indicates that the data set is in perfect fit for factor analysis.[12] In addition, a high KMO value increases the degree of explanation of each item in the scale by other items.[28] In the study, the KMO value was determined as .931, and the fact that it is more than the KMO results desired in the literature and is in perfect agreement, and the Bartlett test value is significant, shows that the scale is suitable for exploratory factor analysis, which will be used to determine its reliability and validity.[12] The KMO and Bartlett test values of the study are given in Table 3 below.

Table 3. Kaiser-Meyer-Olkin (KMO) and Bartlett test results

KMO sample adequacy test	,931	
Bartlett Test of Sphericity	Chi-Square Value	4982,742
	S. Degree	378
	p	,000

IBM SPSS Statistics 25.0 software was used to make statistical calculations. Maximum Likelihood Estimation was used to be parallel to the Structural Equation Model (SEM) as factor extraction method in exploratory factor analysis. Scree Plot, eigenvalues of expressions and percentages of variance were used to determine the number of factors reflecting the relationship between expressions in ATPS.[27] In Table 4, the results of the eigenvalues, variance and stacked variance percentages related to the five dimensions of the ATPS are given.

Table 4. Variance values explained for ATPS

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Dimensions	Total Eigenvalues	Variance %	Cumulative Variance %	Total Eigenvalues	Variance %	Cumulative Variance %	Total Eigenvalues	Variance %	Cumulative Variance %
1	11,274	40,264	40,264	11,274	40,264	40,264	5,146	18,378	18,378
2	2,640	9,430	49,694	2,640	9,430	49,694	3,489	12,461	30,839
3	1,687	6,025	55,719	1,687	6,025	55,719	3,254	11,622	42,461
4	1,110	3,965	59,684	1,110	3,965	59,684	3,050	10,892	53,353
5	1,021	3,647	63,331	1,021	3,647	63,331	2,794	9,978	63,331
6	,911	3,255	66,586						
7	,830	2,964	69,550						
8	,761	2,716	72,267						
9	,699	2,496	74,762						
10	,679	2,424	77,186						
11	,594	2,121	79,307						
12	,575	2,053	81,360						
13	,521	1,862	83,223						
14	,506	1,808	85,031						
15	,482	1,721	86,752						
16	,458	1,637	88,389						
17	,399	1,426	89,815						
18	,392	1,400	91,215						
19	,359	1,281	92,496						
20	,326	1,166	93,662						
21	,302	1,079	94,741						
22	,288	1,027	95,768						
23	,242	,863	96,631						
24	,226	,807	97,439						

According to Table 4, there are five sub-dimensions with eigenvalues greater than 1. The sum of the stacked variance of these sub-dimensions is 63.33%. In the factorial analysis, it is required to explain the variance at the maximum level with the minimum number of factors. The analysis explaining 50-75% of the total variance is considered valid.[29] The eigenvalue, which is the sum of the distribution of the squares of the loaded factors, shows the power of each factor to explain the measurement tool. According to the Kaiser criterion, eigenvalues above 1 are considered appropriate.

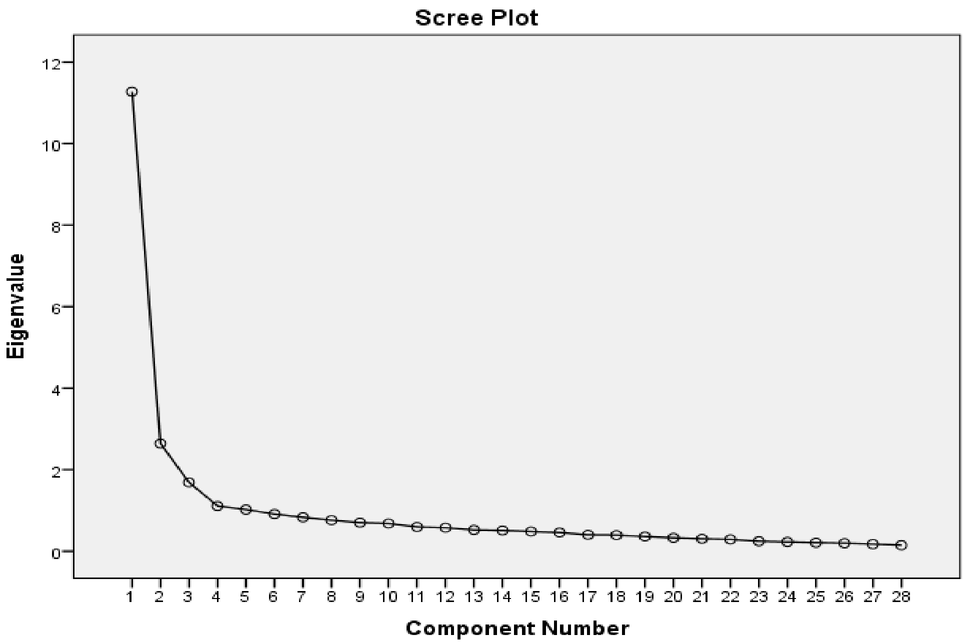


Figure 1. Slope-slope graph of ATPS

The Scree Plot shows the variance value explained by each factor. Interpretation is made by examining the distance between the break points in the graph. The first sharp break shows the factor that explains the most variance. The factors up to the point where the graph takes a horizontal shape represent the most significant factors. Accordingly, when looking at the slope graph in Figure 1, the curve takes a more distinct horizontal shape after the 5th point. This supports that the scale generally consists of five dimensions.

Table 5. Factor loads of ATPS

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Common Variance
Q16	,797					,595
Q35	,783					,613
Q9	,744					,441
Q12	,741					,706
Q11	,686				,543	,512
Q7	,672		,471			,756
Q6	,524					,670
Q8	,511					,813
Q18		,734				,671
Q17		,723				,601
Q19	,445	,640				,413
Q21		,634				,634
Q22		,601				,720
Q3			,668			,691
Q24			,657			,667
Q38			,638			,749
Q37	,408		,545			,735
Q23			,530			,674
Q36				,778		,485
Q27				,765		,526
Q28				,685		,483
Q26				-,661		,691
Q32				,625		,622
Q14				,454		,547
Q10					,735	,742
Q4					,665	,690
Q13			,474		,571	,620
Q15		,425			,548	,666

Extraction Method: Principal Component Analysis.

Rotating the factor loads matrix helps to find a more interpretable factor structure. With this process, it is a value that reveals the relationship between factors and items. The high load value of the factors in which the items are included means that they measure a common structure together.

"Rotated Component Matrix" obtained from factor analysis, items with factor loading values of 0.40 and below, which is the accepted value, and items with a minimum difference of .1 and above with the loads in different factors were discarded in the exploratory factor analysis.[30] In order to ensure content validity, exploratory factor analysis was applied to 36 items in the scale, items Q1, Q2, Q5, Q20, Q25, Q29, Q31, Q33, which did not meet the required conditions, were removed from the scale and the draft ATPS consisting of 28 items and 5 factors was obtained. As a result of exploratory factor analysis, first factor items (Q16, Q35, Q9, Q12, Q11, Q7, Q6, Q8), second factor items (Q18, Q17,QS19, Q21, Q22), third factor items (Q3, Q24, Q38, Q37, Q23), fourth factor items (Q36, Q27, Q28, Q26, Q32, Q14) and fifth factor items (Q4, Q10, Q13, Q15). Table 6 shows the sub-dimensions and naming, item numbers and numbers determined together with the factor analysis.

Table 6. Factors and sub-dimensions of ATPS

Factor	Item Count	Item Numbers	Sub-Dimension
F1	8	Q16, Q35, Q9, Q12, Q11, Q7, Q6, Q8	Positive return (PR)
F2	5	Q18, Q17, Q19, Q21, Q22	Self sufficiency (SS)
F3	5	Q3, Q24, Q38, Q37, Q23	Desire to Learn (DL)
F4	6	Q36, Q27, Q28, Q26, Q32, Q14	The anixety felt (TAF)
F5	4	Q4, Q10, Q13, Q15	Perceived benefit (PB)

2.6. Structural Equation Modeling (SEM)

Structural equation modeling is a hybrid model developed to test causal and correlational relationships between observed and latent variables, and consists of analyzes such as variance, covariance, factor and multiple regression.[31, 32-34]

Structural equation models that are widely used in the literature;

1) Path analysis models (PAM)

2) Confirmatory factor analysis models (CFA)

3) Structural regression models

4) Latent growth curve models

In this study, confirmatory factor analysis (CFA) and path analysis models were preferred.

3. Findings

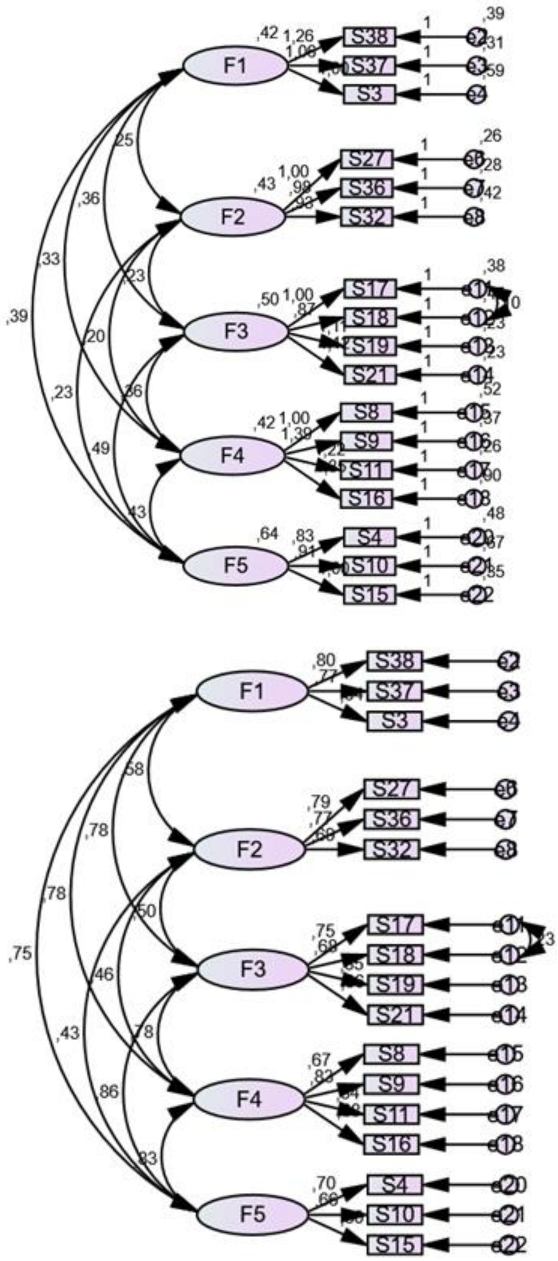
3.1. Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis is based on testing the structure determined by exploratory factor analysis during the scale development and adaptation process. The compatibility of the structure, whose existence was determined by CFA, with the data set is examined.[35] Many fit statistics are used to test the suitability of the models. These fit statistics indicate the fit between the covariance matrix between the parameters of the proposed models and the covariance obtained from the sample data. The chi-square test is an important test used to examine the absolute fit of the proposed structure to the data set.[36] While determining the model fit, Chi-square goodness of fit index is examined as the initial fit index. Along with the chi-square goodness of fit index, Incremental Fit Index (IFI), Comparative Fit Index (CFI), Root Mean Square Errors of Approximation (RMSEA), Goodness of Fit Index (GFI), Normed Fit Index (NFI), Adjusted Goodness of Fit Index (AGFI), Relative Fit Index (RFI) and Standardized Root Mean Errors (SRMR) values are also used.

In this study, the data set obtained from the same sample group was used for EFA and CFA.[37-39] Worthhington & Whitaker[40] suggest that it will not be a problem to perform analysis on the data obtained from the same sample group. The most important reason for the realization of this situation was a questionnaire applied to the specific student group of the sample, who studied in the chemistry department in vocational high schools and met the conditions of being involved in production during the pandemic process. The number of students who meet these conditions and participate in the survey on a voluntary basis is limited.

The compatibility between the five-factor structure that emerged as a result of the exploratory factor analysis and the sample data was examined with the AMOS 25.0 software and the analysis of the data was provided by applying the maximum likelihood model of the elaboration probability model.

In the first level confirmatory factor analysis, it includes the relationship between the factors belonging to the constructed structure and the latent variables in the model and examines the correlation between them. In this study, the data obtained from the sample group of 297 people were used for CFA to examine the fit between the structure and the data. The path diagram of DFA is given in Figure 2.



CMIN=345,698; DF=108; CMIN/DF=3,20; p=0.01; RMSEA=0.08; GFI=0.90; CFI=0.91; TLI=0.90

Figure 2. Path diagram of ATPS and non-standardized and standardized factor loads

With the analysis made, it was observed that there were 3 items under the DL sub-dimension, 3 items under the TAF sub-dimension, 4 items under the SS sub-dimension, 4 items under the PR sub-dimension, and 3 items under the PB sub-dimension. Accordingly, items Q6, Q7, Q12, Q13, Q14, Q22, Q23, Q24, Q26, Q28, Q35 with low factor loading values were excluded from the scale in CFA analyses. It was observed that the path coefficients of the items belonging to all sub-dimensions were statistically significant. When the standardized path coefficients are examined; S38 of the item that has the most effect on the AA sub-dimension, Q27 of the item that has the most effect on the AA sub-dimension, Q21 of the item that has the most effect on the AA sub-dimension, Q9 of the item that has the most effect on the PG sub-dimension, and the most on the PB sub-dimension It was observed that the substance with the effect was Q15.

Table 7. First level confirmatory factor analysis for all sub-dimensions

Items		Latent Variable	B_0	B_1	SH	Test statistics	*p*
Q38	<---	DL	1,26	0,795	0,115	10,955	**<,001**
Q37	<---	DL	1,056	0,775	0,102	10,388	**<,001**
Q3	<---	DL	1	0,645			
Q27	<---	TAF	1	0,791			
Q36	<---	TAF	0,978	0,773	0,085	11,49	**<,001**
Q32	<---	TAF	0,931	0,686	0,088	10,617	**<,001**
Q17	<---	SS	1	0,755			
Q18	<---	SS	0,875	0,677	0,066	13,203	**<,001**
Q19	<---	SS	1,11	0,851	0,074	14,907	**<,001**
Q21	<---	SS	1,116	0,857	0,074	14,996	**<,001**
Q8	<---	PR	1	0,67			
Q9	<---	PR	1,387	0,828	0,113	12,263	**<,001**
Q11	<---	PR	1,223	0,843	0,101	12,105	**<,001**
Q16	<---	PR	1,353	0,68	0,132	10,242	**<,001**
Q4	<---	PB	0,834	0,696	0,069	12,024	**<,001**
Q10	<---	PB	0,906	0,665	0,08	11,355	**<,001**
S16	<---	PG	1,353	0,68	0,132	10,242	**<,001**
Q4	<---	PB	0,834	0,696	0,069	12,024	**<,001**
Q0	<---	PB	0,906	0,665	0,08	11,355	**<,001**
Q15	<---	PB	1	0,803			

β0: standard path coefficients, β1: non-standardized path coefficients, SH: Standard error, *p< ,001 is significant at the level.

Table 7 shows all standardized values as a result of first-level confirmatory factor analysis for all sub-dimensions performed with the AMOS 25.0 software. These values indicate at what level all items in the scale represent for the latent variable.[41] When Table 7 was examined, it was observed that all standardized factor loading values were high. This indicates that the proposed structure is at an acceptable level. The $\chi2$ value of the scale consisting of 17 items and five factors by CFA was found to be 345,698 and $\chi2/df$ value was found to be 3.20 (df=108, p<0.05). According to Şimşek,[42] if the $\chi2/df$ value is below 2, the proposed model shows that it is a good model, and if the result is below 5, it shows that it is at an acceptable level. [43]

Table 8. Standard goodness-of-fit measures and first-level CFA results for ATPS

Compliance Criteria	Excellent Compliance	Acceptable Compliance	CFA Results	Compliance
χ2	0≤c2≤2df	2df≤c2≤3df	345 698	Accaptable
χ2/df	0≤c2/df ≤2	2≤c2/df ≤3	3,20	Accaptable
p Değeri.	0.05≤p≤1	0.01≤p≤0.05	0,01	Accaptable
RMSEA	0≤RMSEA≤0.05	0.05≤RMSEA≤0.08	0,08	Accaptable
SRMR	0≤ SRMR ≤0.05	0.05≤SRMR≤0.10	0,04	Excellent
NFI	0.95≤NFI≤1.00	0.90≤NFI≤0.95	0,90	Accaptable
CFI	0.97≤CFI≤1.00	0.90≤CFI≤0.97	0,91	Accaptable
GFI	0.95≤GFI ≤1.00	0.90≤GFI≤0.95	0,90	Accaptable
AGFI	0.90≤AGFI≤1.00	0.85≤AGFI≤0.90	0,85	Accaptable
RFI	0.90<RFI<1.00	0.85< RFI <0.90	0,86	Accaptable

Although there are some discussions in the literature about the fit indices given in Table 8, generally NFI, GFI and CFI values are greater than 0.90, AGFI and RFI values are greater than 0.85, RMSEA values are 0.08 and SRMR values are greater than 0.90. value below 0.10 indicates an acceptable level of compliance.[42] When Table 13 is examined, it is seen that RMSEA: 0.08, SRMR: 0.04, GFI: 0.90, AGFI: 0.85, NFI: 0.90, CFI: 0.91 and RFI: 0.85. These values statistically support the proposed 17-item five-factor structure. Accordingly, it was seen that the structure and the data within the structure were in good agreement.

3.2. Convergent and Discriminant Validity

Convergent and discriminant validity indicates whether the factors revealed are part of the latent variables.[44] Convergent validity indicates whether the factors with discriminant validity can measure the latent variable, and convergent validity indicates the correlation between the factors revealed and the latent variable.[30] CR> 0.70 for convergent validity; AVE>0.50; CR>AVE criteria must be met. For the discriminant validity to be appropriate, MSV<AVE and ASV<AVE are required. In addition, the square root of the mean explained variance (AVE) calculated for each sub-dimension should be greater than the correlation value between the variables.[30, 45, 46]

Table 9. Combined reliability and explained mean variance values of the sub-dimensions that make up the model

	CR	AVE	MSV	ASV	MaxR (H)	DL	TAF	SS	PR	PB	Cronbach's Alpha
DL	0,784	0,549	0,414	0,530	0,797	0,741[a]					0,806
TAF	0,794	0,564	0,335	0,245	0,801	,579	0,751[a]				0,790
SS	0,866	0,621	0,437	0,554	0,883	,784	,499	0,788[a]			0,874
PR	0,843	0,576	0,448	0,543	0,863	,78	,458	,784	0,759[a]		0,832
PB	0,766	0,573	0,463	0,514	0,780	,751	,435	,859	,828	0,757[a]	0,764

CR: Combined Confidence, AVE: Average Explained Variance, MSV: Maximum Shared Variance, ASV: Average Shared Variance, Note: Diagonal values (a) are the square roots of the Average Explained (AVE) values.

When Table 9 is examined, it is seen that the lowest AVE value calculated for latent variables in convergent and discriminant validity is 0.549 and the lowest calculated CR value is 0.766. In addition, it is seen that the CR values of the sub-dimensions are greater than the AVE values. These results show that convergent validity is provided for all latent variables in the measurement structure. When the analysis results for discriminant validity were examined, it was seen that the ASV and MSV values were smaller than the AVE values.

Research Model and Hypotheses

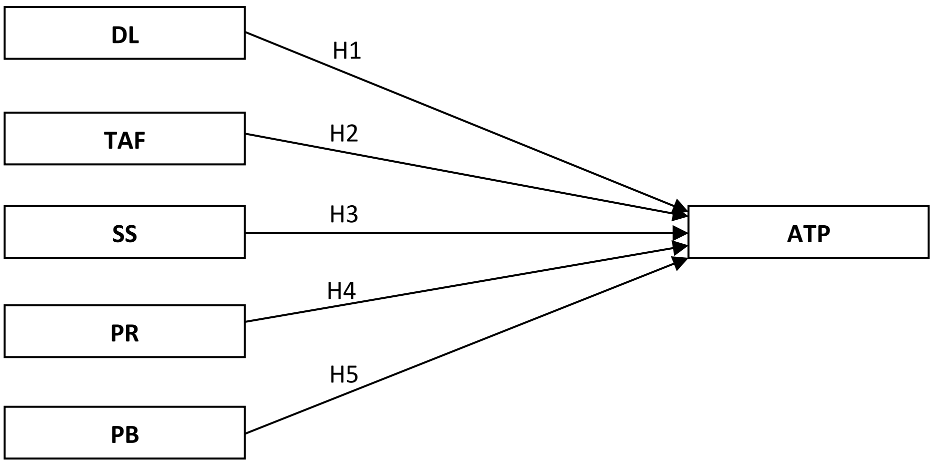


Figure 3. Research hypothesis model

The study was conducted by establishing hypotheses about the sub-dimensions obtained as a result of factor analysis in the light of the data obtained from 297 students studying in the field of chemical technology in vocational high schools affiliated to the Ministry of National Education. The research hypotheses are as follows:

H1: Vocational High School chemistry technology students' perception of willingness to learn has a positive effect on their attitude towards production (the effect of DL on ATP).

H2: The perceived anxiety perception of Vocational High School chemistry technology students has a positive effect on their attitude towards production (the effect of TAF on ATP).

H3: The self-efficacy perception of Vocational High School chemistry technology students has a positive effect on their attitude towards production (the effect of SS on ATP).

H4: The positive return perception of Vocational High School chemistry technology students has a positive effect on their attitude towards production (the effect of PR on ATP).

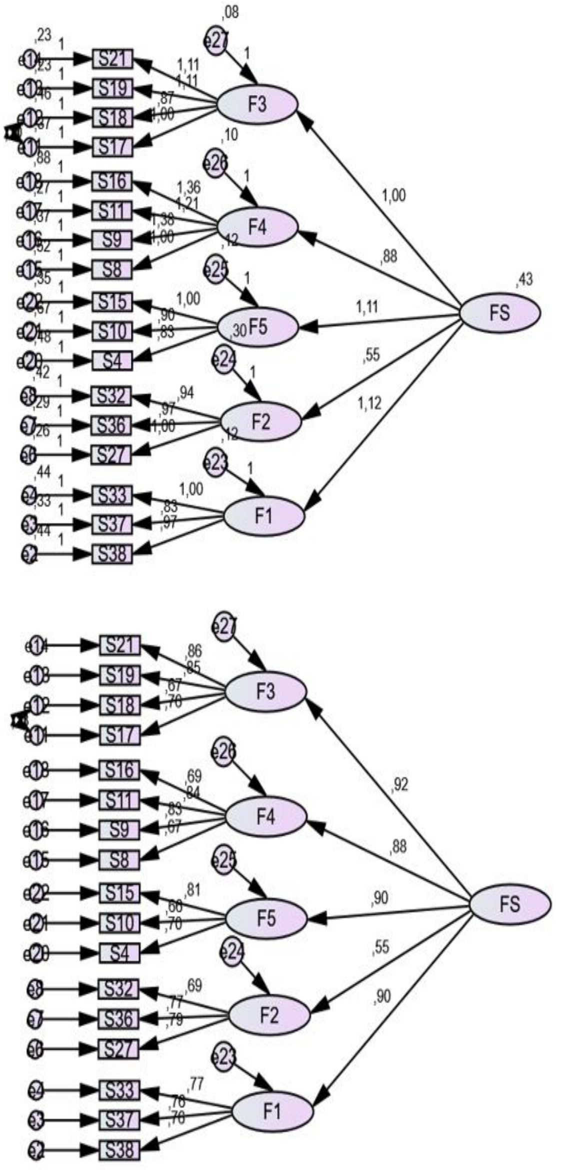
H5: The perceived usefulness perception of Vocational High School students has a positive effect on their attitude towards production (the effect of PB on ATP).

3.3. Testing the Structural Model

3.3.1. Path Analysis

After the model proposed in this section was validated with first level confirmatory factor analysis, the relationships between the variables were tested with structural equation modeling. Here H1: The effect of DL on ATP, H2: The effect of TAF on ATP, H3: The effect of SS on ATP, H4: The effect of PR on ATP, H5: The effect of PB on ATP examined. Path analysis with observed variables was used to test these effects.

Figure 4 shows the non-standardized and standardized path diagram of the attitude scale towards production.



CMIN=354,899; df=113; CMIN/df=3,14; p=0.01; RMSEA=0.08; GFI=0.90; CFI=0.915; TLI=0.90

Figure 4. Non-standardized and standardized path diagram of attitude scale towards production

As a result of SEM analysis, χ2 value was found as 354,899 and χ2/df value was found as 3.14 (df=113, p<0.05). RMSEA: 0.08, SRMR: 0.051, GFI: 0.90, AGFI: 0.90, NFI: 0.90, CFI: 0.915 and RFI: 0.856. These values supported the accuracy of the proposed five-factor model. Accordingly, the results show that the proposed model and the items in the model are in good agreement. Parameter estimates of the analysis are given in Table 10.

Table 10. SEM analysis results for the attitude scale towards production

Items		**Latent Variable**	**B0**	**B1**	**SH**	**Test Statistics**	***p***
SS	<---	ATPS	1	0,921			
PR	<---	ATPS	0,88	0,881	0,089	9,863	<***,001***
PG	<---	ATPS	1,109	0,902	0,095	11,722	<***,001***
TAF	<---	ATPS	0,55	0,546	0,073	7,536	<***,001***
DL	<---	ATPS	1,12	0,904	0,099	11,327	<***,001***
Q38	<---	DL	0,966	0,762	0,075	12,817	<***,001***
Q37	<---	DL	0,826	0,758	0,065	12,651	<***,001***
Q33	<---	DL	1	0,775			
Q27	<---	TAF	1	0,792			
Q36	<---	TAF	0,97	0,767	0,083	11,665	<***,001***
Q32	<---	TAF	0,937	0,691	0,089	10,576	<***,001***
Q17	<---	SS	1	0,758			
Q18	<---	SS	0,866	0,673	0,066	13,2	<***,001***
Q19	<---	SS	1,105	0,851	0,073	15,052	<***,001***
Q21	<---	SS	1,111	0,856	0,073	15,13	<***,001***
Q8	<---	PR	1	0,673			
Q9	<---	PR	1,379	0,827	0,112	12,35	<***,001***
Q11	<---	PR	1,209	0,837	0,099	12,21	<***,001***
Q16	<---	PR	1,363	0,688	0,131	10,41	<***,001***
Q4	<---	PB	0,831	0,695	0,07	11,877	<***,001***
Q10	<---	PB	0,9	0,662	0,08	11,223	<***,001***
Q15	<---	PB	1	0,806			

β0: standard path coefficients, β1: non-standardized path coefficients, SH: Standard error, *p< ,001 is significant at the level.

According to the data obtained in the constructed structural model, it has been seen that the model is compatible and the fit indices comply with the determined limits. In the structural model, basically five hypotheses were examined. Accordingly, all standardized and non-standardized path coefficients of all hypotheses (H1, H2, H3, H4 and H5) were found to be positive and significant.

Table 11 shows the sub-dimensions obtained by factor analysis, the names given to these sub-dimensions and the expressions of the items in each sub-dimension.

Factor name/Sub-Dimension	Expressions
Sub-dimension 1 Desire to learm (DL)	Q3: I like the chemistry lesson more with the work we do in production. Q37: I have a pleasant time while working in production. Q38: Being involved in production increases my desire to research innovations related to chemistry course.
Sub-dimension 2 The anixety felt (TAF)	Q27: I am reluctant to take part in production work. Q32: I find the production work done in our school inefficient. Q36: I look for ways to avoid being involved in production.
Sub-dimension 3 Self sufficiency (SS)	Q17: The fact that I learned about the harms of the chemicals I used during the production stage increases my environmental awareness. Q18: The fact that I use personal protective equipment while working in production allows me to understand the importance of these equipment for human health. Q19: The warning signs affixed on the materials we produce increase my awareness of the warning signs on the materials I use in my daily life. Q21: Being involved in production makes me conscious in terms of occupational safety.
Sub dimension 4 Positive return (PR)	Q8: I think we set an example for other schools with the production we make in our school. Q9: Being involved in production gives me confidence to find a job in the future. Q11: Being involved in production makes me realize the value of the effort given while earning money. Q16: Taking part in the production of cleaning materials allows me to be more meticulous about my own personal cleaning.
Sub dimension 5 Perceived benefit (PF)	Q4: I think that I am beneficial to people with the production we have made in our school during the pandemic process. Q10: I am happy to gain financial gain from production. Q15: Being involved in production helps me understand the difficulties of business life.

3.3.2. Reliability of Measurement

Reliability is a measure of the characteristic and consistency of a test between measurement results. A reliable test or scale gives similar and stable results in separate measurements.[47] In this study, the measurement reliability of the ATPS; reliability coefficient and internal consistency analysis.

3.3.3. Reliability Coefficient

In examining the reliability of the data obtained in the study; Cronbach's Alpha technique was used. In the evaluation of the obtained data; $0.00 \leq \alpha < 0.50$ unreliable, $0.50 \leq \alpha < 0.60$ low, $0.60 \leq \alpha < 0.70$ acceptable, $0.70 \leq \alpha < 0.90$ good and $0.90 \leq a < 1.00$ very good" reliability levels were taken as reference.[48]

3.3.4. Internal Consistency Analysis

The reliability of the data obtained from the ATPS with internal consistency analyzes was determined using the Split Half method and Cronbach Alpha values. In the Split-Half method, the test is divided into two equal halves and the relationship of the parts to each other is examined. The reliability of the scale is commented on over the alpha values of the two parts.

Table 12. Results of split-half reliability analyzes for ATPS

Reliability Coefficients (N:17)	
Correlation Between Forms=.794	Equal Lenght Spearman-Brown = .885
Guttman Split-Half = .867	Unequal Lenght Spearman-Brown = .886
Alpha for the first part.= ,895 (N:9a)	Alpha fort he second part. = ,826 (N:8b)
a Items:Q16, Q9, Q11, Q8, Q17, Q18, Q19, Q21, Q3.	
b Items: Q37, Q38, Q36, Q27, Q32, Q4, Q10, Q15.	

Although the alpha values of the two parts in Table 12 are close to each other, these values are greater than .70. These data indicated that the items were consecutive and at a reliable level. At the same time, the correlation between the forms is .794, the Guttman Split-Half value is .867, the Equal and Unequal Length Spearman-Brown values are .886, indicating that the reliability of the scale is high. In addition, Anova Tukey's Nonadditivity analysis was carried out to determine the homogeneity and relationships of the expressions that make up the ARTS. The results of the analysis are shown in Table 13.

Table 13. Results of Anova Tukey's Nonadditivity Analyzes of the ATPS

			Sum of Squares	df	Mean of squares	F	Sig
Between groups			2167,448	296	7,322		
In group	Between Items		62,205	16	3,888	6,928	,000
	Residual	Nonadditivity	19,239[a]	1	19,239	34,524	,000
		Balance	2638,673	4735	,557		
		Total	2657,912	4736	,561		
	Total		2720,118	4752	,572		
Total			4887,565	5048	,968		
Grand Mean = 4,4038							

a.Tukey's estimate of power to which observations must be raised to achieve additivity = 4,738.

The p value (Sig=000, $p<.01$) determined in Table 13 has a significant value. In this case, it is stated that the expressions in the ATPS are homogeneous and related to each other. It is also seen that the Tukey Nonadditivity value is p=.000. This situation reveals the summability of Likert type scores of the scale.[49]

Hotelling's T2 statistic examines whether the phenomenon to be measured can be measured with the scale.[49] The results of Hotelling's T2 statistics of ATPS are given in Table 14.

Table 14. Hotelling's T2 Analysis Results of the ATPS

Hotelling's T-Squared	**F**	**df1**	**df2**	**Sig**
89,624	5,313	16	281	.000

Hotelling's T2 result was significant (Sig=.000, p<.001). This situation supports that the scale is suitable for measuring the ATPS phenomenon. In the light of the data obtained as a result, the scale created; It is a homogeneous, stable and original scale. Intraclass Correlation Coefficient (ICC), in other words, intra-cluster correlation coefficient analysis, means that expressions on the scale; examines the order, similarities and structure.[49] The ICC analysis results of the ATPS are given in Table 15.

Table 15. ICC analysis results of ATPS

	Intraclass Correlation[b]	**95% Confidence Interval**		**F Test with True Value 0**			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measurements	,415[a]	,373	,460	13,048	296	4736	,000
Average Measurements	,923[c]	,910	,936	13,048	296	4736	,000

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.

According to the ICC results of the ATPS, both the variances and the total variances of the test halves were close to each other. These results indicate that the expressions in the scale; Considering the order, similarities and structure, it is a reliable scale. The measurement tool seems to be reliable in terms of both single measurements (sig=0.000, p<0.01) and mean measurements (sig=0.000, p<0.01).[49] According to the ICC analysis, if the ICC result; A value of <.40 indicates a weak level of intra-class correlation, a medium-level correlation between .40-.59, a good level of intra-class correlation between .60-.74, and an excellent level of intra-class correlation if >.74.[25]

According to the results of the analysis, the single measurement value (.415) of the intra-class relations reveals that the average measurement value (.923) is at the excellent level.

In Table 16, the Cronbach Alpha coefficient, which is an indicator of reliability, is given for the items in each sub-dimension.

Table 16. Cronbach Alpha coefficients for ATPS and its sub-dimensions

Dimension	Item Count	Item Numbers	Cronbach Alpha
DL	3	Q3, Q37, Q38	0,80
TAF	3	Q27, Q32, Q36	0,79
SS	4	Q17, Q18, Q19, Q21	0,87
PR	4	Q8, Q9, Q11, Q16	0,83
PB	3	Q4, Q5, Q10	0,76
		Whole Test	0,92

In Table 16, it is seen that the Cronbach Alpha values for each sub-dimension obtained as a result of factor analysis are extremely high. According to the data, the internal consistency and reliability of the scale are quite high. There are various accepted values for the reliability intervals of the Cronbach Alpha coefficient in the literature. For pilot studies, the Cronbach Alpha coefficient should be at least 0.7.[50] In this context, the Cronbach Alpha coefficient obtained from the pilot application for the ATPS was found to be .92.

4. Discussion

It is important to determine the attitudes of education stakeholders in the field of education and to make evaluations as a result of the findings. It is possible to predict behaviors based on attitudes, and to interpret the satisfaction received from success and education.[7, 16] In this study, studies on vocational education in the literature were examined and an attitude scale towards production in vocational education was developed.

The results of the validity and reliability of the developed scale show that the scale can be used to determine the attitudes of students studying at vocational high schools during the pandemic process. In addition, it is thought that the developed attitude scale will contribute to the determination of the attitudes of the students studying in the field of chemical technology in vocational high schools in normal periods (outside the pandemic period) towards production, and to the vocational education studies to be made based on these results and to all education stakeholders.

5. Implications and Recommendations

During the literature review, the focal points of the research were determined in the sources examined, and accordingly, the following suggestions were made. In the light of the findings obtained as a result of the research, in further research;

1. The research includes the data obtained from 297 students studying in the field of chemical technology in 14 MTAL affiliated to the Ministry of National Education and who took an active role in production during the pandemic process. Since the number of students who met these conditions and participated in the survey on a voluntary basis was limited, exploratory and confirmatory factor analyzes were carried out on the data obtained from the same sample group. In this context, the scale can be revised with a wider participation in the study.

2. Since the scale is designed specifically for vocational high school students studying in the field of chemical technology as a sample group, if the scale will be used in groups other than this, validity and reliability studies should be conducted with the data to be obtained from those groups.

3. ATPS is designed to determine the attitudes of students studying in the field of chemical technology towards production. In vocational high schools, the scale should be revised to serve its purpose in other fields other than the field of chemical technology or in determining other situations related to vocational education.

4. The scale created in this study is aimed at measuring the attitudes of students studying in the field of chemical technology at vocational high schools and taking part in production. The fact that the 1st factor variance value was 40.264% in the EFA analysis supports that the sample group works actively in production. The scale should be revised in order to serve the purpose in determining the opinions of the students studying in the field of chemical technology on issues other than production.

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