

List of the items

Scale		Item	Content of the scale question (Chinese)	Std. loading (EFA)	
Teacher–student relationship (8 items)	Closeness (4 items)	Q1	When encountering difficulties in learning chemistry, I am willing to share my confusion with the chemistry teacher.	0.819	
		Q2	Praise from the chemistry teacher makes me more willing to study chemistry diligently.	0.757	
		Q3	The chemistry teacher makes me feel kind, and I enjoy attending his/her class.	0.805	
		Q4	The chemistry teacher seriously considers my opinions and suggestions.	0.797	
	Conflict (4 items)	Q1	Interacting with the chemistry teacher always makes me feel mentally exhausted.	0.509	
		Q2	In chemistry class, I am often criticized for being inattentive or interrupting; sometimes I dare not ask questions even when I don't understand.	0.713	
		Q3	I feel embarrassed when the chemistry teacher points out my mistakes in front of the whole class.	0.825	
		Q4	I feel unhappy for a long time after being criticized by the chemistry teacher.	0.826	
Interest in chemistry (4 items)		Q1	I think chemistry is a very interesting subject	0.862	
		Q2	I consider chemistry to be a very important subject.	0.756	
		Q3	I believe the chemistry content I am currently learning is very useful.	0.780	
		Q4	I know how to apply what I have learned in chemistry to real-life situations.	0.755	
Chemistry academic engagement (13 items)		Dedication (4 items)	Q1	Learning chemistry can inspire me.	0.688
			Q2	I am passionate about learning chemistry.	0.751
			Q3	I find learning chemistry challenging.	0.831
			Q4	I find my purpose in learning chemistry to be clear and meaningful.	0.636
			Q5	I feel proud of my chemistry learning.	Delete
		Vigor Absorption (9 items)	Q6	I remain persistent and do not get discouraged even when I encounter difficulties in learning chemistry.	Delete
			Q7	I can concentrate on learning chemistry for long periods without needing a break.	0.718
			Q8	When learning chemistry, I can quickly recover from mental fatigue.	0.770
			Q9	I feel energetic when learning chemistry.	0.787
			Q10	I feel vigorous and motivated when learning chemistry.	0.823
			Q11	I feel eager to learn chemistry as soon as I wake up in the morning.	0.771
			Q12	I feel happy when I am fully engaged in learning chemistry.	Delete
			Q13	I become deeply absorbed in my chemistry studies.	0.620
Q14	I find it hard to disengage from my chemistry learning.	0.571			
Q15	My mind is fully occupied with chemistry when I am learning it.	0.643			
Q16	Time seems to pass quickly when I am learning chemistry.	0.563			
Q17	I often become oblivious to my surroundings when learning chemistry.	Delete			