# Appendix A: ATI16 and ATI22 Items

**22-Item ATI**

|  |  |
| --- | --- |
| No. | Item |
| 1 | In this subject students should focus their study on what I provide them |
| 2 | It is important that this subject should be completely described in terms of specific objectives that relate to formal assessment items |
| 3 | In my interactions with students in this subject I try to develop a conversation with them about the topics we are studying |
| 4 | It is important to present a lot of facts to students so that they know what they have to learn for the subject |
| 5 | I set aside some teaching time so that the students can discuss, among themselves, key concepts and ideas in this subject |
| 6 | In this subject I concentrate on covering the information that might be available from key tests and readings |
| 7 | I encourage students to restructure their existing knowledge in terms of the new way of thinking about the subject that they will develop |
| 8 | In teaching sessions for this subject, I deliberately provoke debate and discussion |
| 9 | I structure my teaching in this subject to help students to pass the formal assessment items |
| 10 | I think an important reason for running teaching sessions in this subject is to give students a good set of notes |
| 11 | In this subject, I provide the students with the information they will need to pass the formal assessments |
| 12 | I should know the answers to any questions that students may put to me during this subject |
| 13 | I make available opportunities for students in this subject to discuss their changing understanding of the subject |
| 14 | It is better for students in this subject to generate their own notes rather than copy mine |
| 15 | A lot of teaching time in this subject should be used to question students' ideas |
| 16 | In this subject my teaching focuses on the good presentation of information to students |
| 17 | I see teaching as helping students develop new ways of thinking in this subject |
| 18 | In teaching this subject it is important for me to monitor students' changed understanding of the subject matter |
| 19 | My teaching in this subject focuses on delivering what I know to the students |
| 20 | Teaching in this subject should help students question their own understanding of the subject matter |
| 21 | Teaching in this subject should include helping students find their own learning resources |
| 22 | I present material to enable students to build up an information base in this subject |

**16-Item ATI**

|  |  |
| --- | --- |
| No. | Item |
| 1 | I design my teaching in this subject with the assumption that most of the students have very little useful knowledge of the topics to be covered |
| 2 | I feel it is important that this subject should be completely described in terms of specific objectives relating to what students have to know for the formal assessment items |
| 3 | In my interactions with students in this subject I try to develop a conversation with them about the topics we are studying |
| 4 | I feel it is important to present a lot of facts to students so that they know what they have to learn for this subject |
| 5 | I feel that the assessment in this subject should be an opportunity for students to reveal their changed conceptual understanding of the subject |
| 6 | I set aside some teaching time so that the students can discuss, among themselves the difficulties that they encounter studying the subject |
| 7 | In this subject I concentrate on covering the information that might be available from a good textbook |
| 8 | I encourage students to restructure their existing knowledge in terms of the new way of thinking about the subject that they will develop |
| 9 | In teaching sessions for this subject, I use difficult or undefined examples to provoke debate |
| 10 | I structure this subject to help students pass the formal assessment items |
| 11 | I think an important reason for running teaching sessions in this subject is to give students a good set of notes |
| 12 | In this subject, I only provide the students with the information that they will need to pass the formal assessments |
| 13 | I feel that I should know the answers to any questions that students may put to me during the subject |
| 14 | I make available opportunities for the students in this subject to discuss their changing understanding of the subject |
| 15 | I feel that it is better for students in this subject to generate their own notes rather than always copy mine |
| 16 | I feel a lot teaching time in this subject should be used to questions students' ideas |

# Appendix B: Complete List of Reviewed Studies

**Use ATI and do not report psychometrics**

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**Use ATI and report psychometrics**

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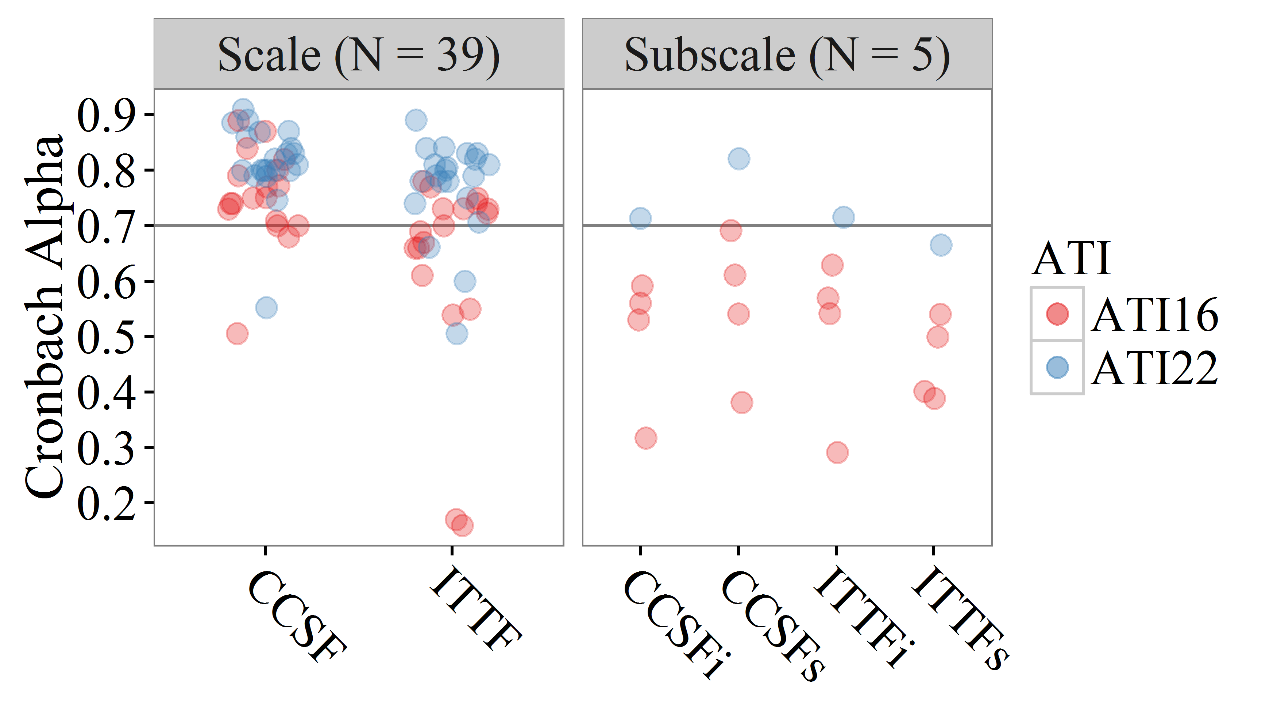
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# Appendix C: Additional 19 Models Discovered

|  |  |  |  |
| --- | --- | --- | --- |
| **Model** | **Structure** | | **ATI instrument** |
| *Factor* | *Items* |
| 10 | One Factor | 2,3,4,6,7,8,9,10,11,12,13,14,15,16 | ATI16 |
| 11 | CCSF | 3+6+7+8+9+14+15+16 |
| ITTF | 2+4+7+10+11+12+13 |
| Error covariance terms | 2&10, 9&12, 3&6 |
| 12 | Conceptual change | 8,16 |
| Focus on test scale | 2,10 |
| Discussion among student scale | 6,14 |
| Discussion between students and teacher | 3,9 |
| Information transmission | 4,7 |
| Focus on notes scale | 11,15 |
| 13 | CCSF | 3,6,8,9,14,15,16 |
| ITTF | 2,7,11,12,13 |
| 14 | CCSF | 2,7,12 |
| ITTF | 3,6,9,14,15,16 |
| 15 | CCSF scale |  |
| CCSF (intention) subscale | 8,15,16 |
| CCSF (strategy) subscale | 3,6,9,14 |
| ITTF scale |  |
| ITTF (intention) subscale | 2,4,11,13 |
| ITTF (strategy) subscale | 7,10,12 |
| 16 | CCSF scale |  |
| CCSF (intention) subscale | 8,15,16 |
| CCSF (strategy) subscale | 3,6,9,14 |
| ITTF scale |  |
| ITTF (intention) subscale | 2,4,11 |
| ITTF (strategy) subscale | 7,10,12 |
| 17 | Student focused | 3,8,9,14,16 |
| Teacher focused | 2,4,12 |
| 18 | CCSF | 3,6,8,14 |
| ITTF | 2,4,7,10,11,12,13 |
| 19 | CCSF | 3,5,7,8,13,14,15,17,18,21 | ATI22 |
| ITTF | 1,2,4,6,9,10,11,12,16,19,22 |
| Error covariance terms | 6&14, 3&9, 10&12,  11&15, 2&10, 22&21 |
| 20 | CCSF | 5,7,8,13,14,17,21 |
| ITTF | 1,2,3,4,9,11,12,16,19,22 |
| 21 | CCSF scale |  |
| Making meaning subscale | 7,13,17,21 |
| Student-led discussion subscale | 5,8,14 |
| ITTF scale |  |
| Information transmission subscale | 1,16,19 |
| Focused on notes subscale | 9,11,12 |
| Focused on tests subscale | 3,4,22 |
| 22 | Teacher focused | 1,4,6,9,12,22 |
| Student focused | 5,14,18,21 |
| 23 | CCSF | 3,5,7,8,12,13,14,16,18 |
| ITTF | 1,2,4,6,9,10,11,15,17 |
| 24 | CCSF | 1,2,4,6,9,10,11,12,16,19,22 |
| ITTF | 3,7,8,13,14,15,18 |
| 25 | CCSF | 3,5,7,8,13,14,15,17,18,20,21 |
| ITTF | 1,4,6,9,10,11,12,16,19,22 |
| 26 | Conceptual change | 3,9,13,15,16,20,22 |
| Information transmission | 5,7,8,10,17,18 |
| Focused on group discussion | 2,11,14,19 |
| Focused on tests | 1,6,12,21 |
| 27 | CCSF | 3,5,7,8,13,14,15,17,18,20,21,22 |
| ITTF | 1,2,4,6,9,10,11,12,16,19 |
| 28 | CCSF | 3,5,7,8,13,14,16,17,19,20 |
| ITTF | 1,2,4,6,9,10,11,12,15,18 |

# Appendix D: Coefficient alpha for All Models Similar to Original



The preceding figure is a reproduction of Figure 2 in the manuscript except that it also included 15 additional models that were similar to, but not exact replicas of the original CCSF and ITTF Scales. For example, Model 14 only contains 9 out of the original ATI16 items under CCSF and ITTF scales. Because it’s not the exact same items, the estimate of reliability will be affected, although they purport to measure similar scales.

# Appendix E: CFA Fit Statistics

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model | N | 2 | df | p | 2/df | CFI | TLI | RMSE | RMSEA.low | RMSEA.high | p | SRMR | AIC | BIC |
| 1 | 267 | 444.358 | 76 | 0 | 5.847 | 0.458 | 0.351 | 0.135 | 0.123 | 0.146 | 0 | 0.143 | 10907.46 | 11061.71 |
| 2 | 267 | 376.685 | 71 | 0 | 5.305 | 0.55 | 0.423 | 0.127 | 0.115 | 0.139 | 0 | 0.134 | 10839.58 | 11011.77 |
| 3 | 267 | 456.818 | 208 | 0 | 2.196 | 0.802 | 0.78 | 0.067 | 0.059 | 0.075 | 0 | 0.074 | 16148.98 | 16389.32 |
| 22 | 267 | 421.79 | 77 | 0 | 5.478 | 0.492 | 0.4 | 0.13 | 0.118 | 0.141 | 0 | 0.131 | 10874.87 | 11025.54 |
| 24 | 267 | 377.088 | 72 | 0 | 5.237 | 0.551 | 0.432 | 0.126 | 0.114 | 0.138 | 0 | 0.137 | 10842.86 | 11011.46 |
| 27 | 267 | 406.843 | 202 | 0 | 2.014 | 0.837 | 0.813 | 0.062 | 0.053 | 0.07 | 0.011 | 0.071 | 16102.59 | 16364.46 |
| 30 | 267 | 276.088 | 53 | 0 | 5.209 | 0.595 | 0.495 | 0.126 | 0.112 | 0.14 | 0 | 0.12 | 9238.131 | 9370.859 |
| 32 | 267 | 35.758 | 25 | 0.075 | 1.43 | 0.973 | 0.952 | 0.04 | 0 | 0.067 | 0.693 | 0.037 | 7367.364 | 7510.854 |
| 33 | 267 | 414.884 | 118 | 0 | 3.516 | 0.662 | 0.61 | 0.097 | 0.087 | 0.107 | 0 | 0.103 | 12637.26 | 12823.8 |
| 34 | 267 | 348.672 | 95 | 0 | 3.67 | 0.729 | 0.658 | 0.1 | 0.089 | 0.111 | 0 | 0.102 | 11838.16 | 11985.24 |
| 35 | 267 | 97.099 | 34 | 0 | 2.856 | 0.75 | 0.67 | 0.083 | 0.065 | 0.102 | 0.002 | 0.074 | 7628.7 | 7739.905 |
| 36 | 267 | 510.736 | 134 | 0 | 3.811 | 0.613 | 0.558 | 0.103 | 0.094 | 0.112 | 0 | 0.132 | 13642.93 | 13840.23 |
| 37 | 267 | 77.291 | 51 | 0.01 | 1.516 | 0.947 | 0.931 | 0.044 | 0.023 | 0.062 | 0.689 | 0.056 | 8804.627 | 8944.53 |
| 38 | 267 | 128.154 | 26 | 0 | 4.929 | 0.545 | 0.369 | 0.121 | 0.102 | 0.141 | 0 | 0.106 | 6877.004 | 6977.447 |
| 40 | 267 | 312.652 | 60 | 0 | 5.211 | 0.627 | 0.515 | 0.126 | 0.112 | 0.14 | 0 | 0.13 | 9978.346 | 10089.55 |
| 41 | 267 | 98.751 | 19 | 0 | 5.197 | 0.612 | 0.428 | 0.125 | 0.102 | 0.15 | 0 | 0.109 | 6172.129 | 6261.81 |
| 43 | 267 | 242.615 | 134 | 0 | 1.811 | 0.873 | 0.854 | 0.055 | 0.044 | 0.066 | 0.207 | 0.065 | 13241.54 | 13438.84 |
| 44 | 267 | 415.501 | 188 | 0 | 2.21 | 0.809 | 0.786 | 0.067 | 0.059 | 0.076 | 0 | 0.074 | 15435.61 | 15665.2 |
| 45 | 267 | 655.531 | 183 | 0 | 3.582 | 0.598 | 0.539 | 0.098 | 0.091 | 0.106 | 0 | 0.123 | 15701.34 | 15948.86 |
| 46 | 267 | 422.43 | 203 | 0 | 2.081 | 0.825 | 0.801 | 0.064 | 0.056 | 0.072 | 0.003 | 0.073 | 16121.72 | 16380 |
| 51 | 267 | 471.609 | 208 | 0 | 2.267 | 0.79 | 0.767 | 0.069 | 0.061 | 0.077 | 0 | 0.078 | 16163.38 | 16403.72 |
| 53 | 267 | 261.071 | 43 | 0 | 6.071 | 0.495 | 0.354 | 0.138 | 0.123 | 0.154 | 0 | 0.135 | 8744.797 | 8866.763 |
| 54 | 267 | 561.649 | 169 | 0 | 3.323 | 0.648 | 0.604 | 0.093 | 0.085 | 0.102 | 0 | 0.125 | 15000.01 | 15218.83 |

# Appendix F: 4- and 5-Factor EFA Results

**EFA – 4 Factor Solution**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Factor1** | **Factor2** | **Factor3** | **Factor4** |
| 9 | 0.835 | 0.31 | -0.316 |  |
| 11 | 0.685 |  |  |  |
| 6 | 0.597 |  |  |  |
| 4 | 0.581 |  |  |  |
| 2 | 0.528 |  |  |  |
| 10 | 0.519 |  |  |  |
| 1 | 0.402 |  |  |  |
| 12 | 0.39 |  |  |  |
| 16 | 0.354 |  |  |  |
| 19 | 0.322 |  |  |  |
| 22 |  |  |  | 0.389 |
| 13 |  | 0.496 |  |  |
| 5 |  | 0.76 |  |  |
| 17 |  |  | 0.73 |  |
| 8 |  | 0.652 | 0.314 |  |
| 3 |  | 0.529 |  |  |
| 15 |  | 0.445 | 0.426 |  |
| 14 |  |  |  |  |
| 20 |  |  | 0.577 |  |
| 7 |  |  | 0.594 |  |
| 18 |  |  | 0.502 |  |
| 21 |  |  |  | 0.989 |
| Var | 0.141 | 0.238 | 0.335 | 0.392 |

**EFA – 5 Factor Solution**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item** | **Factor1** | **Factor2** | **Factor3** | **Factor4** | **Factor5** |
| 9 | 1.05 |  |  |  | 0.869 |
| 11 | 0.784 |  |  |  | 0.377 |
| 4 | 0.654 |  |  |  |  |
| 6 | 0.612 |  |  |  |  |
| 10 | 0.597 |  |  |  |  |
| 2 | 0.579 |  |  |  |  |
| 1 | 0.49 |  |  |  |  |
| 16 | 0.446 |  |  |  |  |
| 12 | 0.439 |  |  |  |  |
| 19 | 0.381 |  |  |  |  |
| 17 |  | 0.788 |  |  |  |
| 20 |  | 0.688 |  |  |  |
| 7 |  | 0.604 |  |  |  |
| 18 |  | 0.587 |  |  |  |
| 15 |  | 0.454 | 0.333 |  |  |
| 21 |  | 0.441 |  | 0.304 |  |
| 8 |  |  | 0.573 |  |  |
| 14 |  |  |  |  |  |
| 13 |  |  | 0.406 |  |  |
| 5 |  |  | 0.783 |  |  |
| 3 |  |  | 0.542 |  |  |
| 22 |  |  |  | 1.008 |  |
| Var. | 0.186 | 0.304 | 0.380 | 0.436 | 0.490 |