

Table 1. Student survey about effectiveness of different pedagogical approaches.

Factor	JiTT with peer instruction		Some reading questions and small group work		Mostly lecture	
	Mean ± SD	Pos / Neg	Mean ± SD	Pos / Neg	Mean ± SD	Pos / Neg
Professor	6.24 ± 0.97	92% pos / 2% neg	6.64 ± 0.64	100% pos / 0% neg	6.28 ± 0.83	97% pos / 0% neg
Friends/informal groups	5.20 ± 0.94	80% pos / 2% neg	5.85 ± 0.96	94% pos / 0% neg	5.52 ± 1.48	83% pos / 3% neg
Course organized groups	4.12 ± 2.45	60% pos / 0% neg	4.36 ± 1.87	52% pos / 0%	4.97 ± 1.47	66% pos / 3% neg
Evening chemistry tutoring	1.48 ± 2.28	12% pos / 0% neg	1.55 ± 2.62	18% pos / 0% neg	1.41 ± 2.04	10% pos / 7% neg
Lecture – overall	5.59 ± 1.29	85% pos / 10% neg	6.28 ± 0.80	100% pos / 0% neg	6.24 ± 0.82	97% pos / 0% neg
Clicker questions	5.69 ± 1.22	81% pos / 5% neg	0	NA	0	NA
Discussing clicker questions	5.92 ± 1.10	88% pos / 2% neg	0	NA	0	NA
Exams	5.51 ± 1.11	83% pos / 7% neg	5.42 ± 1.02	85% pos / 3% neg	5.52 ± 1.22	83% pos / 7% neg
Quizzes	5.69 ± 0.89	90% pos / 0% neg	5.15 ± 1.67	79% pos / 6% neg	1.55 ± 2.47	17% pos / 3% neg
Reading questions	4.88 ± 1.45	67% pos / 12% neg	3.31 ± 2.65	53% pos / 0% neg	1.17 ± 2.33	21% pos / 0% neg
Homework/exercises	5.05 ± 2.09	74% pos / 0% neg	6.36 ± 0.85	97% pos / 0% neg	6.52 ± 0.62	100% pos / 0% neg
Textbook	5.19 ± 1.03	79% pos / 5% neg	4.55 ± 1.72	58% pos / 15% neg	3.86 ± 1.33	28% pos / 21% neg
Spectral Zoo	5.45 ± 1.40	79% pos / 2% neg	3.27 ± 2.48	39% pos / 3% neg	0	NA
Reaction Zoo	5.52 ± 1.87	79% pos / 0% neg	4.03 ± 2.46	61% pos / 3% neg	0	NA
Small group work	5.50 ± 1.05	83% pos / 2% neg	4.91 ± 1.53	73% pos / 0% neg	3.24 ± 2.75	45% pos / 7% neg
Lab – overall	5.41 ± 0.80	88% pos / 0% neg	5.12 ± 1.17	73% pos / 9% neg	5.55 ± 0.85	90% pos / 0% neg
Lab manual	5.14 ± 1.01	67% pos / 2% neg	4.88 ± 1.47	67% pos / 12% neg	5.10 ± 1.27	79% pos / 0% neg
strongest	9 – lecture 8 – clicker questions 6 – discussing clicker questions 6 – group activities 5 – reaction zoo 5 – homework/exercises 4 – quizzes 3 – spectral zoo 2 – reading questions 1 – lab 1 – exams 1 – instructor		15 – lecture 13 – homework 5 – instructor 3 – group activities 2 – exams 1 – quizzes 1 – lab 1 – office hours 1 – evening chemistry tutoring		13 – homework 9 – lecture 3 – instructor 3 – group activities 2 – exams 1 – quizzes 1 – lab 1 – office hours	