



International Efforts To Encourage Critical Clinical Thinking (CCT) Skills In Veterinary Students



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Background

In 2009, the University of Illinois College of Veterinary Medicine initiated a new curriculum which begins with 8 x 1 week clinical experiences followed by 3 x 8 week integrated mega-courses integrating anatomy, histology, physiology, and neurobiology and a thread of 2 hrs/week Clinical Correlations (CC).

Observations

- Integrated courses, but retention still problematic – *greater stickiness needed*
- CC initially about *more content rather than process*
- More time devoted to evaluating than guiding*
- More *intentional* and *graduated* practice and guidance on critical clinical thinking was necessary

This study was designed to evaluate the efficacy of paired individual and small group exercises on CCT development assessed using a standardized test of critical thinking before and after instruction. Exercises were designed to increase in complexity and decline in scaffolding after initial instruction in EBM, scientific literature, experimental design, and simple stats. Further, a comparison of CCT and instruction was made between students at a US and a German CVM. ¹

Overview of Illinois Integrated Veterinary Professional Curriculum

Time of year	Year 1	Year 2	Year 3	Year 4
Fall semester 1 st half	VM 601 Clinical Practice I	VM 605 Pathobiologic Basis of Disease I	VM 609 Diagnostic Treatment, and Prevention I	VM 614 Clinical Practice V
Fall semester 2 nd half	VM 602 Structure and Function I	VM 606 Clinical Practice II: Microscopic Examination I	VM 610 Diagnostic Treatment, and Prevention II	VM 615 Clinical Practice VI
Spring semester 1 st half	VM 603 Structure and Function II	VM 607 Pathobiologic Basis of Disease II	VM 611 Diagnostic Treatment, and Prevention III	VM 616 Clinical Practice VII
Spring semester 2 nd half	VM 604 Structure and Function III	VM 608 Pathobiologic Basis of Disease III	VM 612 Clinical Practice III: Microscopic Examination II	VM 617 Professional Development GRADUATION
Summer	vacation	vacation	VM 613 Clinical Practice IV	employment

CC Session: Active Instructor-Student & Student-Student Dynamic



Aims

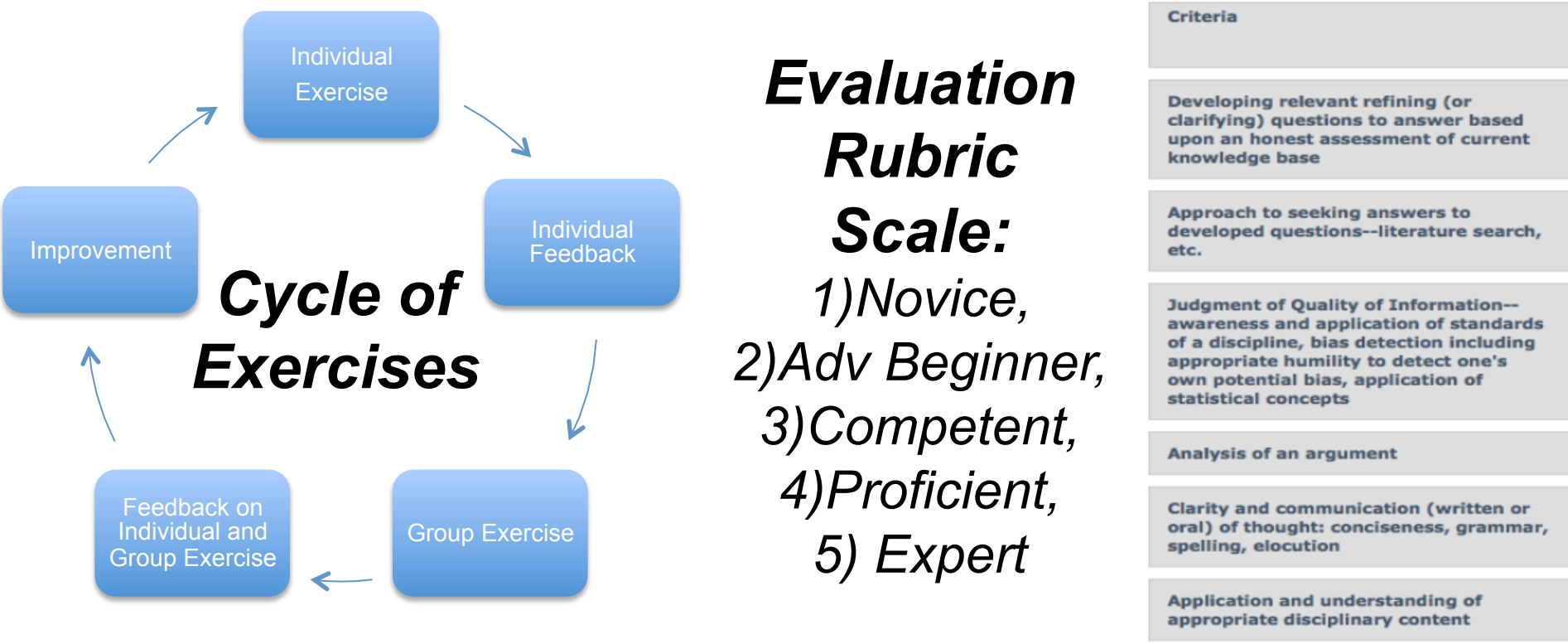
- To evaluate the instructional merit of structured individual and group exercises emphasizing critical clinical thinking (CCT) skills early in the veterinary curriculum
- To compare experience with CCT exercises between U.S. and German veterinary curricula

Why Critical Clinical Thinking?

- Pre-clinical veterinary curricula have been associated with *decline* in critical thinking scores²
- Practice and peer teaching = highest retention
- Decision-making = heart of clinical practice
- CCT and EBM may engender negative reactions, so training should reinforce it
- “not teaching clinicians about clinical uncertainty has been referred to as ‘the greatest deficiency of medical education throughout the twentieth century.’”³

Methods

- Weekly **individual** and related **group-based problems/cases** were developed: **scaffolding** reduced throughout year
- More focus on **process** than on content
- Discipline-specific** exercises were sought to aid with integration skills
- Instructors openly **modeled their thinking**



Illinois CVM Study (n=108)

- The Cornell Critical Thinking Test, Level Z (CCTZ) was administered to all VM1 students in the class of 2016 during the first and last CC class (October and May)
- Groups of 6-7 were created to have equal average pre-scores
- Each 8-week course had 4-5 individual and group exercises for a total of 14 paired exercises.
- Critical analysis of the scientific literature was explicitly taught during the first five CC sessions of the first didactic quarter and again once during each subsequent quarter
- Seven exercises involved case analyses using web-based software at <http://www.whenknowingmatters.com>
- Credit was given for completion, and evaluated by a consistent rubric (shown above).

TiHo CVM Study (Germany) (n=31; 18 pre-test only)

- 15 TiHo 5th and 7th semester TiHo students participated in a semester-long 30 clock-hour case-based course on critical clinical thinking in endocrinology or pharmacology
- A German translation of the California Critical Thinking Skills Test (CCTST) was administered at the beginning and end of the semester to 31 TiHo students
- As a comparison, Illinois 33 VM1 students were administered the English version of the CCTST in October 2013

Results

Pre-test v. Post-test Performance

Illinois students: tested with CCTZ (n = 108)

- Overall scores did not change:** 31.06 ± 0.40 v. 31.31 ± 0.43 (mean ± SEM, p = 0.54 paired t-test). Scores of 50 students increased, 11 did not change, and 47 decreased from pretest to posttest.
- Peer group did not affect individual performance:** two-way ANOVA with repeated measures of 9 groups in which all members consented to participate revealed no effect of group on scores of 54 individuals.
- Meanings & Fallacies (Analysis) subscore increased:** 4.89 ± 0.15 v. 5.48 ± 0.17 (mean ± SEM, p = 0.00125 paired t-test; possible high score = 11)

TiHo students: tested with CCTST (n = 13)

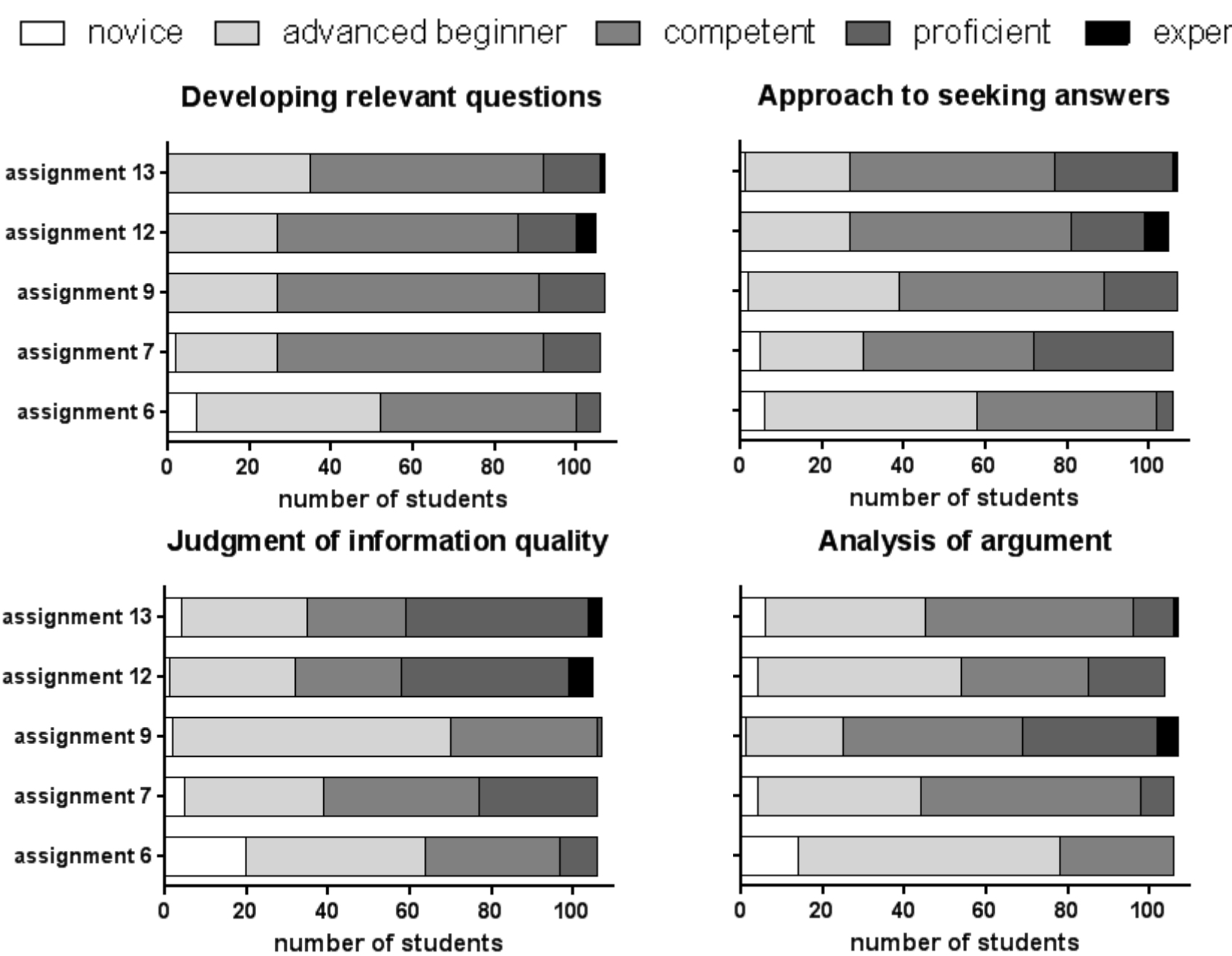
- Overall scores did not change:** 16.85 ± 1.28 v. 18.96 ± 1.27 (mean ± SEM, p = 0.08 paired t-test).
- Induction subscore increased:** 9.69 ± 0.80 v. 11.31 ± 0.86 (mean ± SEM, p = 0.02 paired t-test)

Results

Rubric performance of Illinois students

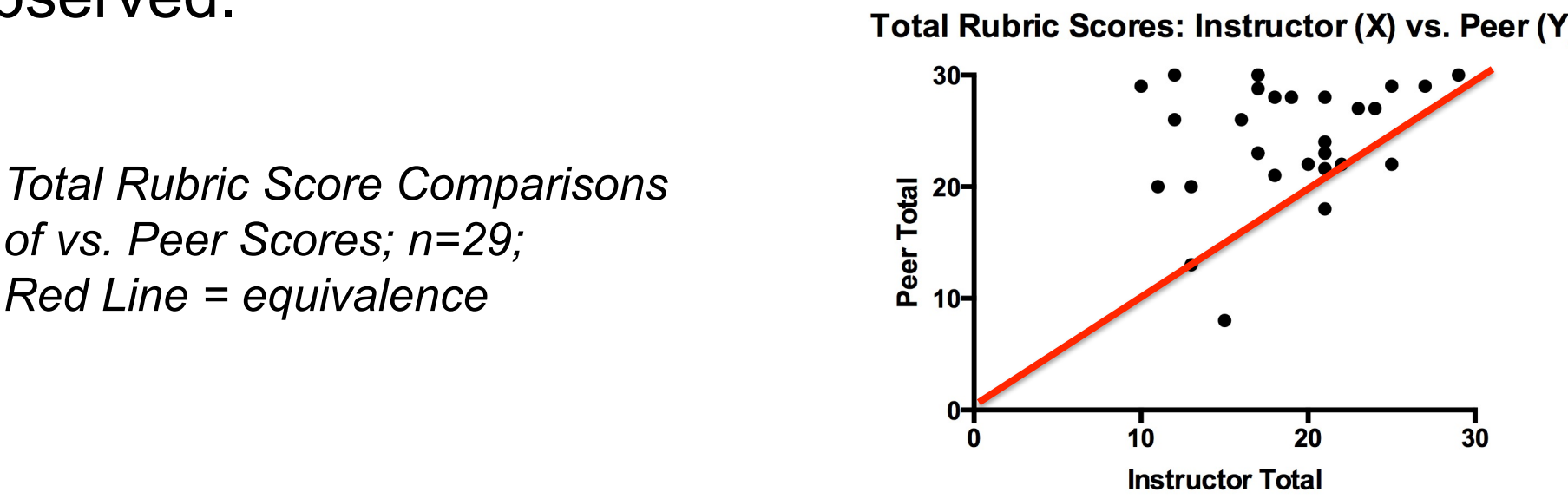
Instructor Evaluations:

Rubric scores on case exercises performed in EBA software increased in all categories. Five assignments graded by one instructor using all rubric categories were analyzed using 5 x 5 contingency tables for ordered categorical data. Positive trends are significant by both z-test and Chi-square, p < 0.001.



Peer Evaluation Trial:

In an attempt to reduce turn-around time for individual feedback, peer analysis of one exercise in the 3rd didactic quarter was compared to instructor analyses. Students made many appropriate comments about a peer's case analysis (assignment 12), but graded significantly higher than the instructor in total scores (p<0.001) and in all rubric categories (p<0.01) except “Judgment of Quality of Information.” Median peer scores were higher by +2 ranks for “Developing questions” and “Clarity and Communication,” and +1 for the other 3 significant categories. No significant correlation of total scores was observed.



Baseline CCTST Scores: Illinois and TiHo

Despite similar age and years of total education, overall scores and most sub-scores were significantly higher for American vs. German students. Nonetheless, the subjective observation was that German students were quite comfortable with discussing uncertainties associated with clinical decisions. Parenthetically, they appeared less familiar with standardized multiple-choice tests.

	Illinois 2017	TiHo	p
OVERALL	20.27	17.23	0.001
Deduction	9.24	7.39	0.003
Analysis	4.82	4.74	0.792
Inference	9.61	7.77	0.002
Induction	11.03	9.84	0.027
Evaluation	5.85	4.71	0.009
n	33	31	
age	20 - 32	21 - 27	

Student Feedback

- Positive student comments focused on the case-based reinforcement of prior didactic instruction
- Early exercises in analysis of the literature, experimental design, and statistics were less popular.
- Some students found the outside-of-class effort harder to appreciate perhaps because the CCT experiences were not evaluated through high-stakes exams

Challenges

- Convincing faculty to work toward greater uniformity in the approach to CCT exercises
- More time time devoted to active learning and problem-solving may be necessary
- Faster turn-around time for providing individualized feedback would be ideal

Conclusions

- Rubric scores on case-based exercises improved with time and instruction in critical thinking, clinical problem solving, and basic science
- Overall general critical thinking skills did not improve after focused instruction on CCT, although statistical improvement in an individual category was seen in both U.S. and German students
- Peers graded significantly higher than the instructor, but made appropriate critiques about the case analysis
- Comparisons across cultures and educational systems requires assessment of baseline performance by standardized exams and exercises.

Notes and References

- All students were enrolled in the UIUC IRB-approved study and allowed to opt out at any time
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