



Differences in Common and Specialized Content Knowledge Improvement between Groups

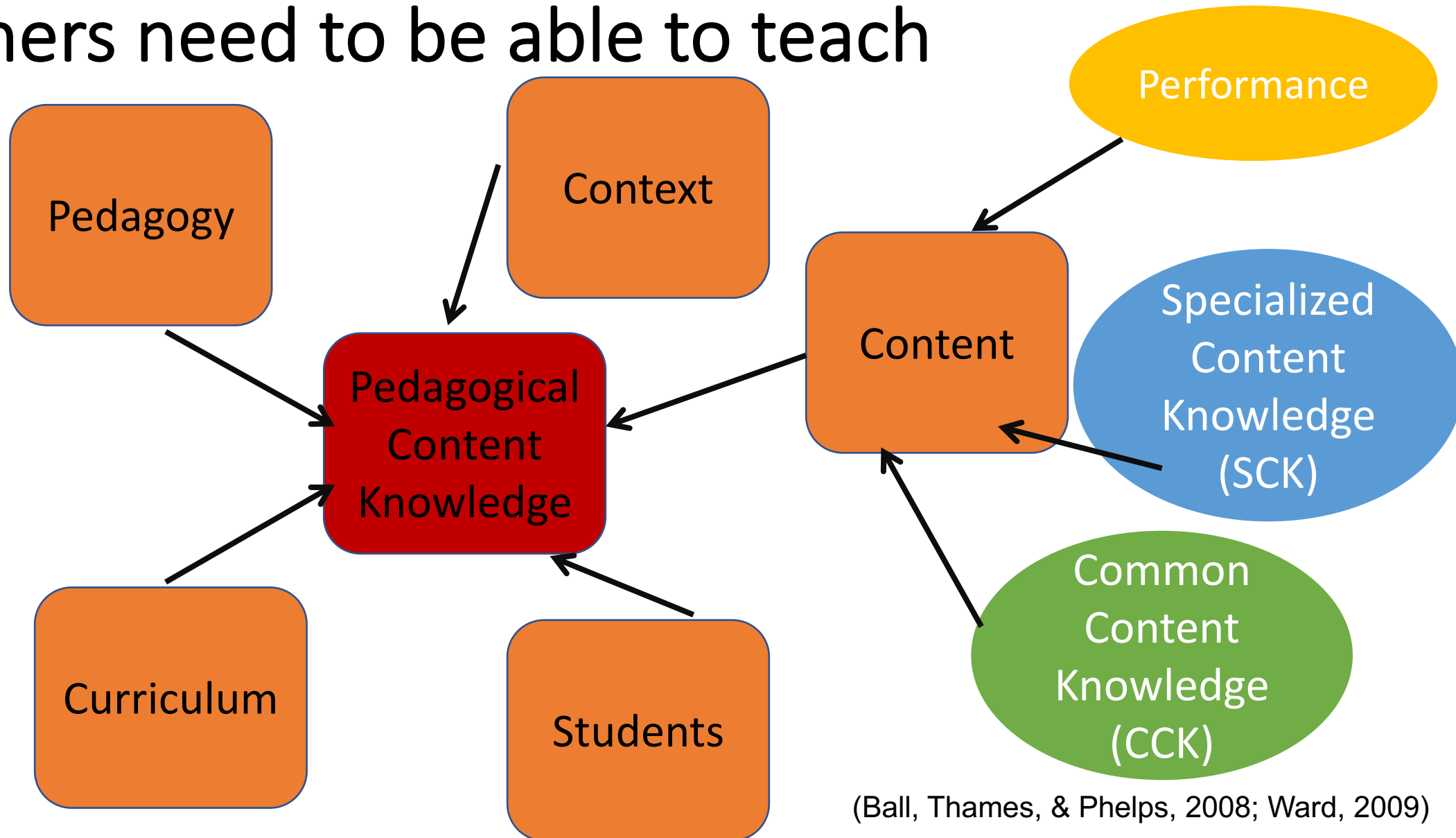
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The Learning to Teach Physical Education Research Program
URL: <https://u.osu.edu/ltp/>

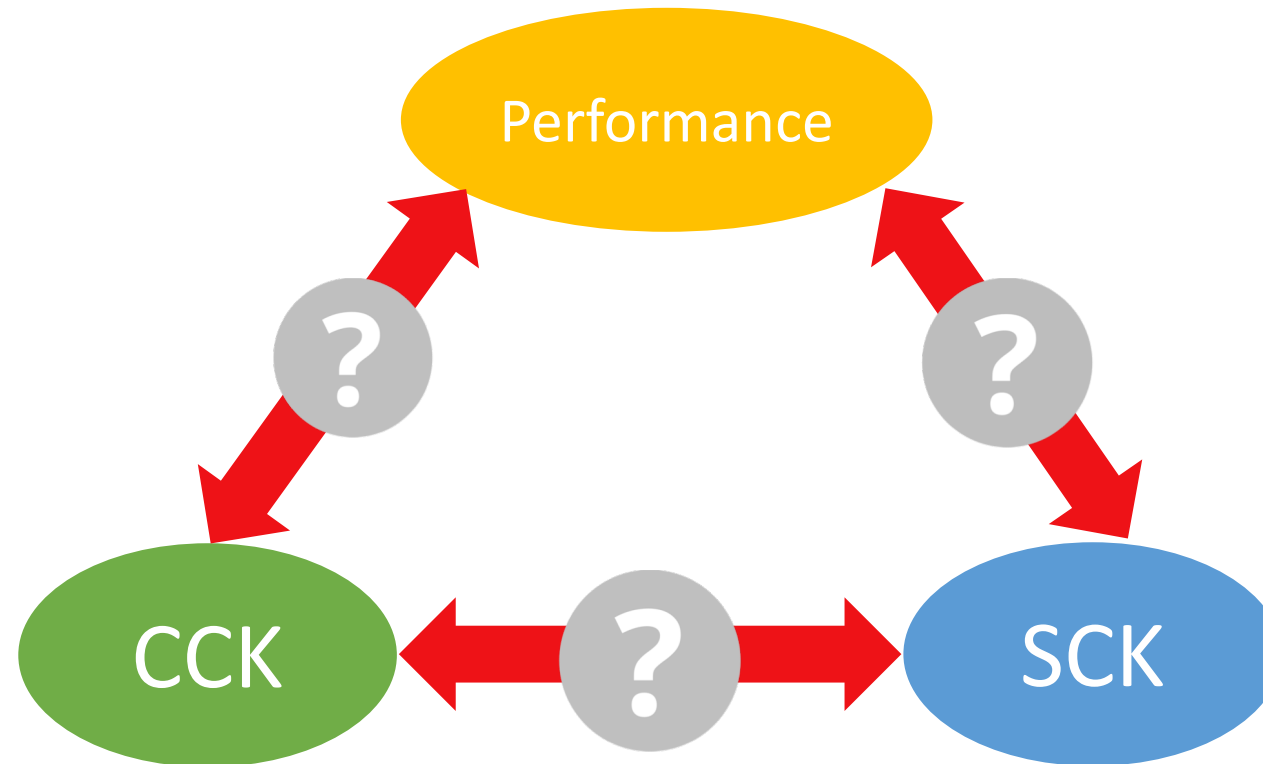
Content is one of several types of knowledge teachers need to be able to teach



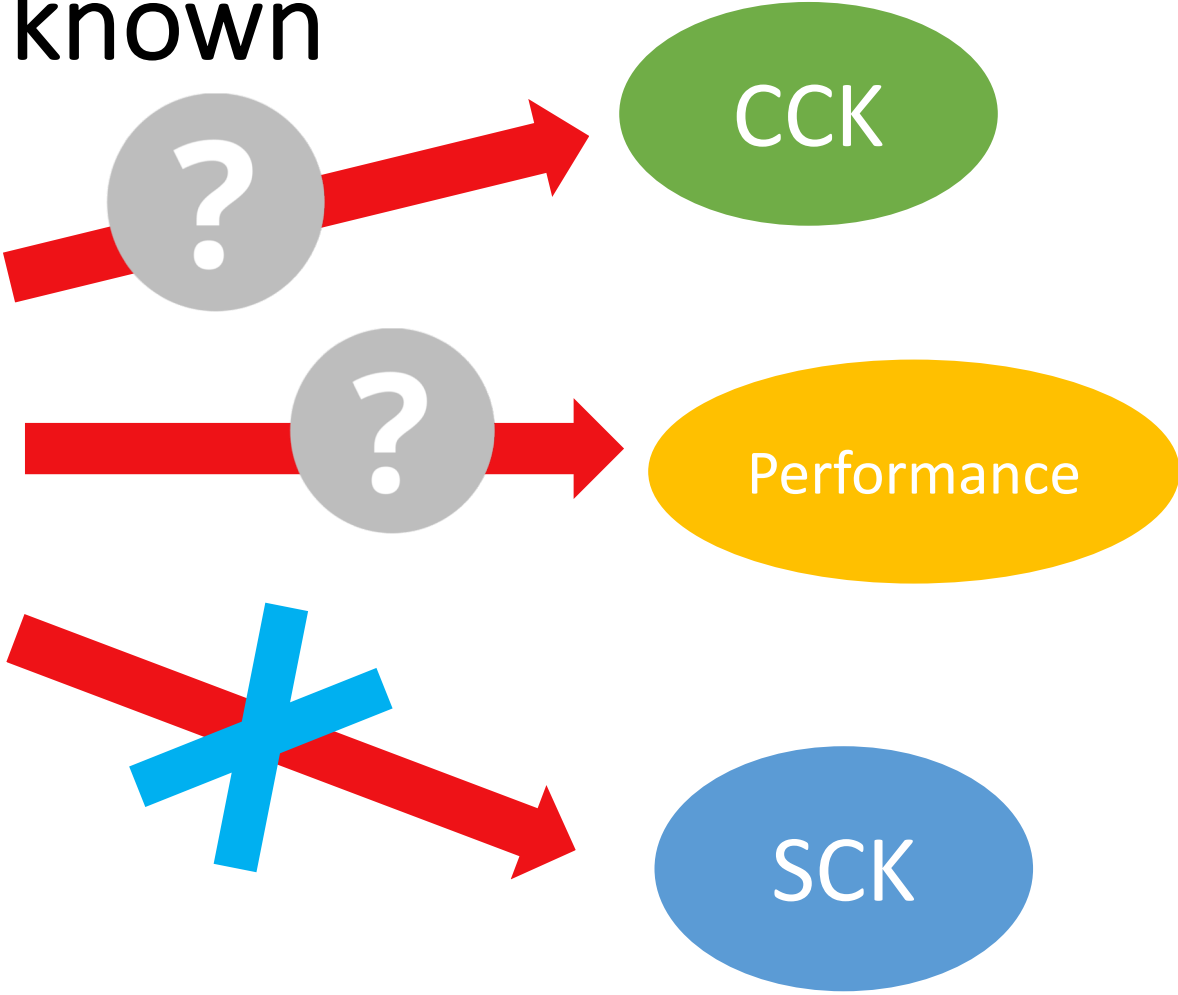
(Grossman, 1990)

(Ball, Thames, & Phelps, 2008; Ward, 2009)

Relationships between components of Content Knowledge are not known



The Impact of K-12 Experiences on Content Knowledge is not fully known



(Stefanou, 2018; Ward & Ayvazo, 2016; Ward et al., 2017)

Purposes

1. To examine the impact of K-12 PE and extracurricular experiences on CCK, performance, and SCK.
2. To investigate the impact of two different types of courses on students' CCK, performance, and SCK, as well as the relationships among these variables.

RQ1. What are the impact of K-12 PE and extracurricular experiences on CCK, performance, and SCK?

RQ2. What are the impact of two different types of courses on students' CCK, performance, and SCK?

RQ3. What are the relationships among CCK, performance, and SCK?

Methods

- We recruited students enrolled in 2 PETE courses: volleyball/basketball (25), tennis/badminton (16), AND students enrolled in 4 Basic Instruction courses: Volleyball (34), Basketball (26), Tennis (21), and Badminton (24) for a total *N* of 146

Courses

Basic Instruction

- 2 hours per week
- $\frac{1}{2}$ to $\frac{2}{3}$ course on skill development
- Second $\frac{1}{2}$ to $\frac{1}{3}$ of the course spent in game and tournament play
- End of semester test on CCK and Performance

PETE

- 3 hours per week (1 in a classroom discussing SCK)
- $\frac{1}{2}$ of semester spent on one sport
- 10 instances of peer teaching and participating in a peer's lesson
- Daily quiz on SCK scenarios
- Weekly quiz on critical elements of skills
- Weekly quiz on CCK
- End of semester test on SCK and Content Map
- End of semester test of Performance

Methods cont.

- Each student was evaluated for CCK, Performance, and SCK at the beginning of the semester before instruction began and then at the end of the semester (or that unit of sport for PETE) with the same tests
- At the end of the semester students completed a demographic survey

Tennis CCK example

Rules

- The server has scored 2 points. The receiver has scored 1 point. What is the current score?
- A serve has landed downline, not crosscourt, is it a legal serve?
- A shot was taken and lands on the receiver's backline. Does this shot score a point?
- How many times can the ball hit the ground on your side of the net before you must return it?

Techniques

- What are the techniques/critical elements for hitting a forehand?
- What are the techniques/critical elements for hitting a backhand?
- What are the techniques/critical elements for holding a racket in a forehand grip?

Tactics/Strategies (only singles)

- Where should you position yourself on the court between each shot?
- You notice your opponent has a very strong forehand. What should you do?
- If your opponent hits a ball to the far back corner of your backhand and then stays on the backline, where do you return the ball to get back on offense?

Tennis Performance Scenarios

- **Ready position**

- A student demonstrates a ready position (not hitting a ball). 3 Criteria x 1 trial 3pts.

- **Move to the ball**

- A student stands on the center mark. A tester tosses the ball beside the student to his/her forehand. The student hits the ball to anywhere he/she wants (limited to inside of the court). 2 criteria x 3 trials 6pts.

- **Forehand**

- A student stands on the center mark. A tester tosses the ball from the other side of the course. The student hits forehand to the cross court. 4 criteria x 3 trials 12pts

- **Backhand**

- A student stands on the center mark. A tester tosses the ball from the other side of the course. The student hits backhand to the cross court. 4 criteria x 3 trials 12pts

- **Tennis total = 33pts**

Basketball Performance Scenarios

- **Defense stance/Mirroring**

- A student demonstrates a defense position (freeze 5 seconds to code). Then, a tester moves four directions and a student mirrors the movement. 4 criteria x 1 trial 4pts / 1 criteria x 3 trials 3pts

- **Lay-up**

- A student demonstrates lay-ups. 4 criteria x 3 trials 12pts

- **Cut**

- Create a 2 (a passer & a student) vs. 1 (a defender [tester A]) situation. Tester B passes a ball to a student defended by the defender. The student cuts and receives a ball from the passer. 2 criteria x 3 trials 6pts

- **Basketball total = 25pts**

Badminton Performance Scenarios

- **Ready position**

- A student demonstrates a ready position (not hitting a shuttle). 3 criteria x 1 trial 3pts

- **Forehand long serve**

- A student demonstrates a forehand long serve (cross court). 4 criteria x 3 trials 12pts

- **High clear**

- A tester hits a long serve and a student performs a high clear to straight court (not cross court). 4 criteria x 3 trials 12pts

- **Badminton total = 27pts**

Volleyball Performance Scenarios

- **Ready Position**

- Students demonstrate a ready position (not hitting a ball). 3 pts x 1 trial
3 pts.

- **Pass**

- Students will receive a toss over the net while at the center point of the 10ft line and must have the pass go above the height of the net and land in a set area on either side of the court. 4 criteria x 3 trials 12pts

- **Set**

- Students will receive a toss over the net while at the center point of the 10ft line and must set the ball above the height of the net and have it land in a designated area on either side of the court. 4 criteria x 3 trials
12pts

- **Volleyball total = 27pts**

Elementary BB Content Map (5 Day Unit)

END
GAME

→ 3v3 – Pass & Dribble
Competitive
Active

3v2 – Pass & Dribble
Competitive
Active

3v3 Pass
Only
Competitive
Active

2 v 1 w PAC
Competitive
Active
Passive

3v2 Pass
Only

1v1 Dribble w
Shot

1v1 in Gen Space w PAC

1v1 in Self-Space
w PAC

1 v 1 Tap
Out

Dribble in Gen
Space

Dribble in Gen
Space

3
Person
Sliding

Poly Spot
Shooting w Reb

Wall Shots w
Reb

Ind. Shooting
w Reb

Pass While
Moving

Partner
Passing

SCK
Content Map

DRIBBLING

DEFENSE

SHOOTING

PASSING

Demographic Information

1. Gender: *Male Female*

2. What year are you in school?

Freshman Sophomore Junior

Senior Graduate Student

3. Why are you taking this class?

4. On a scale of 1 to 7 (1 is never played before, 7 is an expert), how would you rank your ability **before** taking this class?

5. On a scale of 1 to 7 (1 is never played before, 7 is an expert), how would you rank your ability now, **after** taking this class?

6. I have played in recreation leagues

Never, 1-2 years, 3-5 years, more than 5 years

7. I have played on a club team

Never, 1-2 years, 3-5 years, more than 5 years

8. I have played for a high school team

Never, 1 year, 2 years, 3 years, 4 years

9. I have played on a college team

Never, 1 year, 2 years, 3 years, 4 years

10. I have taken private lessons before

Never, 1-2years, 3-5 years, more than 5 years

11. I **currently** play in a recreation league: *Yes, No*

12. I **currently** play on a club team: *Yes, No*

13. I **currently** play on a college team: *Yes, No*

14. I am **currently** taking lessons outside of this class: *Yes, No*

15. I have taught this sport in a school setting before: *Yes, No*

A. If yes, where? *Elementary, junior high, high school, university*

B. If yes, how long? *1-2years, 3-5 years, more than 5 years*

16. I have coached this sport before: *Yes, No*

A. If yes, where? *recreation teams, club teams, school teams*

B. If yes, how long (total)? *1-2 years, 3-5 years, more than 5 years*

Analysis

- Descriptive statistics were examined by sport and then by sport and group
- We used the demographic survey to split students into groups
 - Those with more than 2 years of playing experience (at any one level) and those with less than 2 years
 - Those with any teaching or coaching experience and those with no teaching experience
 - T-Tests were examined when possible (enough students in each cell and data normally distributed)
- Pre-Post Test data was non-normally distributed so non-parametric tests were used for further analysis
 - Differences between types of courses used a Mann-Whitney U test
 - Sports were different so were analyzed separately
 - Spearman rho analyses were used for correlations between components
 - Wilcoxon Signed Rank test was used for pre to post test differences

Demographics and CCK Pretest

Means and SD of more than 2 years playing vs less than 2 years playing experience

	Less than 2 yrs. playing			More than 2 yrs. playing			Difference in group mean percent
	N	Mean (S)	SD	N	Mean (%)	SD	
Volleyball	32	5.72 (44)	2.53	13	7.69 (59)	2.46	15
Basketball	13	6.77 (45)	3.86	24	9.83 (66)	2.81	21
Badminton	30	5.67 (35)	2.95	0	
Tennis	25	5.24 (33)	2.22	1	10 (63)	...	30

Means and SD of teaching/coaching experience vs no teaching/coaching experience

	No teaching/coaching			Teaching/coaching			Difference in group mean percent
	N	Mean (%)	SD	N	Mean (%)	SD	
Volleyball	40	6.10 (47)	2.49	5	7.80 (60)	3.63	13
Basketball	25	8.04 (54)	3.79	12	10.25 (68)	2.22	14
Badminton	29	5.59 (35)	2.97	1	8 (50)	...	15
Tennis	25	5.24 (33)	2.22	1	10 (63)	...	30

Demographics and Performance Pretest

Means and SD of more than 2 years playing vs less than 2 years playing experience

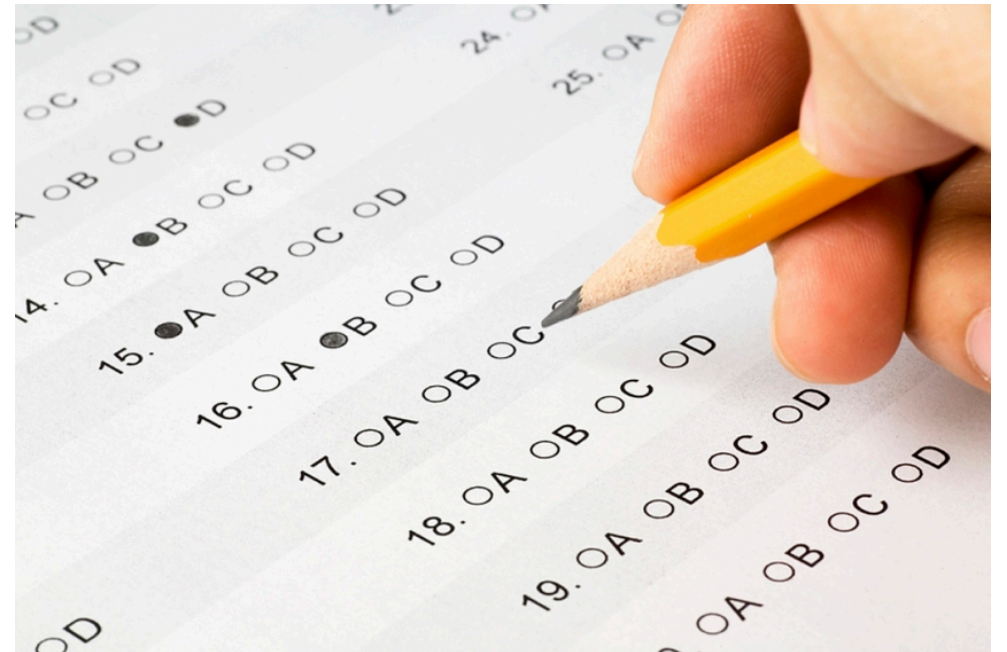
	Less than 2 yrs. playing			More than 2 yrs. playing			Difference in group mean percent
	N	Mean (S)	SD	N	Mean (%)	SD	
Volleyball	19	20.26 (75)	3.48	3	24.33 (90)	2.89	15
Basketball	12	16.83 (67)	3.79	24	17.29 (69)	3.11	2
Badminton	25	15.44 (57)	6.34	2	21.50 (80)	2.12	23
Tennis	27	21.44 (65)	4.44	1	33 (100)	...	35

Means and SD of teaching/coaching experience vs no teaching/coaching experience

	No teaching/coaching			Teaching/coaching			Difference in group mean percent
	N	Mean (%)	SD	N	Mean (%)	SD	
Volleyball	20	20.60 (76)	3.62	2	23.0 (85)	4.24	9
Basketball	23	16.0 (64)	2.45	13	19.15 (77)	3.74	13
Badminton	26	15.77 (58)	6.41	1	19 (70)	...	12
Tennis	27	21.44 (65)	4.44	1	33 (100)	...	35

Findings

- Demographic information had low numbers in groups with experience so it is hard to draw conclusions and make generalizations
- Percent increases with experience were often still below passing rates for CCK tests but above passing rates for Performance



Significant increases in Pre- to posttest scores

PETE

Volleyball

- CCK (23%) and SCK (3.35) *Performance not assessed*

Basketball

- CCK (30%), Performance (14%), and SCK (1.63)

Badminton

- CCK (18%), Performance (22%), and SCK (1.21)

Tennis

- CCK (31%), Performance (13%), and SCK (1.73)

Basic Instruction

Volleyball

- CCK (23%) and SCK (0)

Basketball

- Performance (32%)

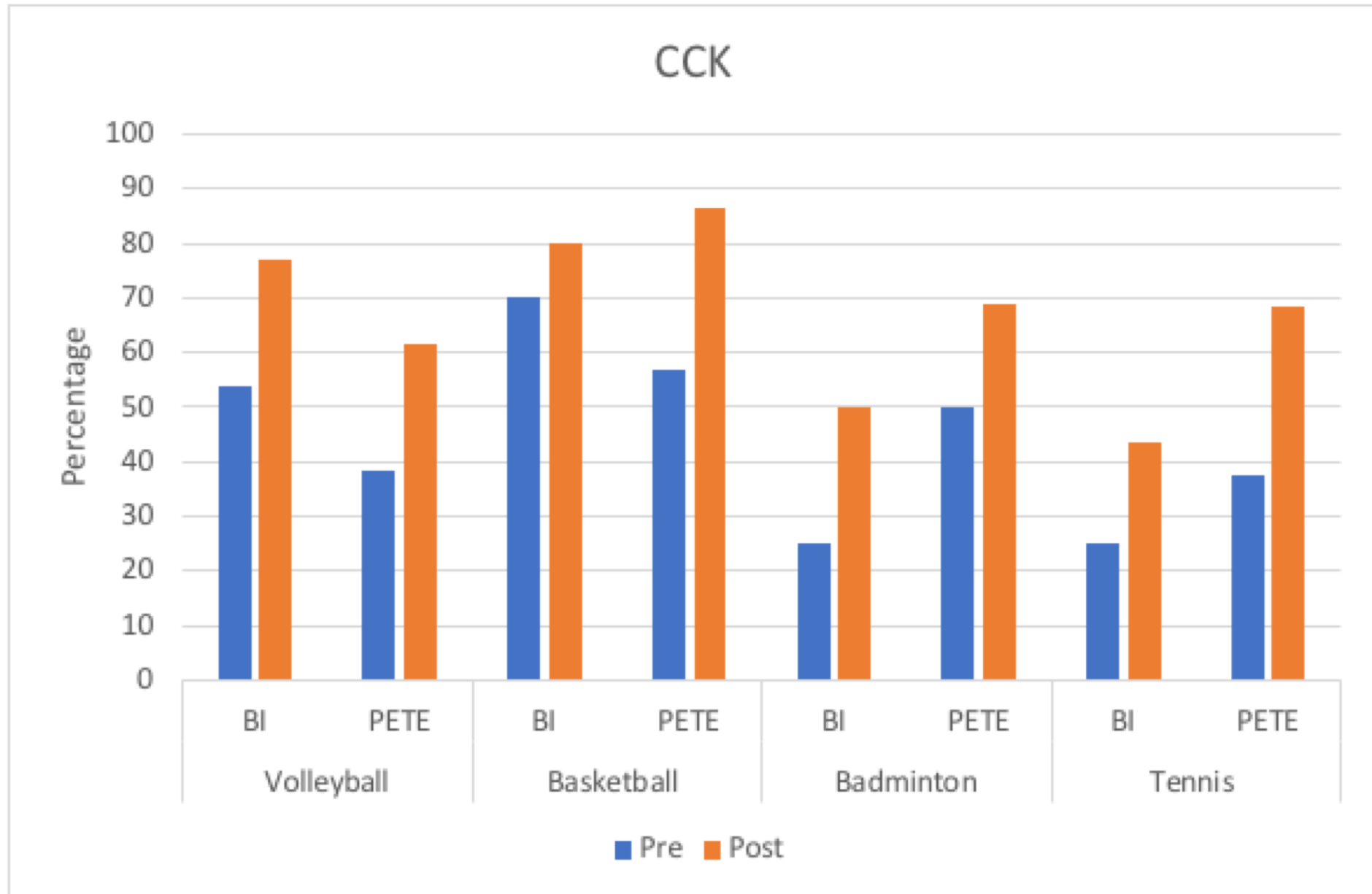
Badminton

- CCK (25%), Performance (15%), and SCK (.29)

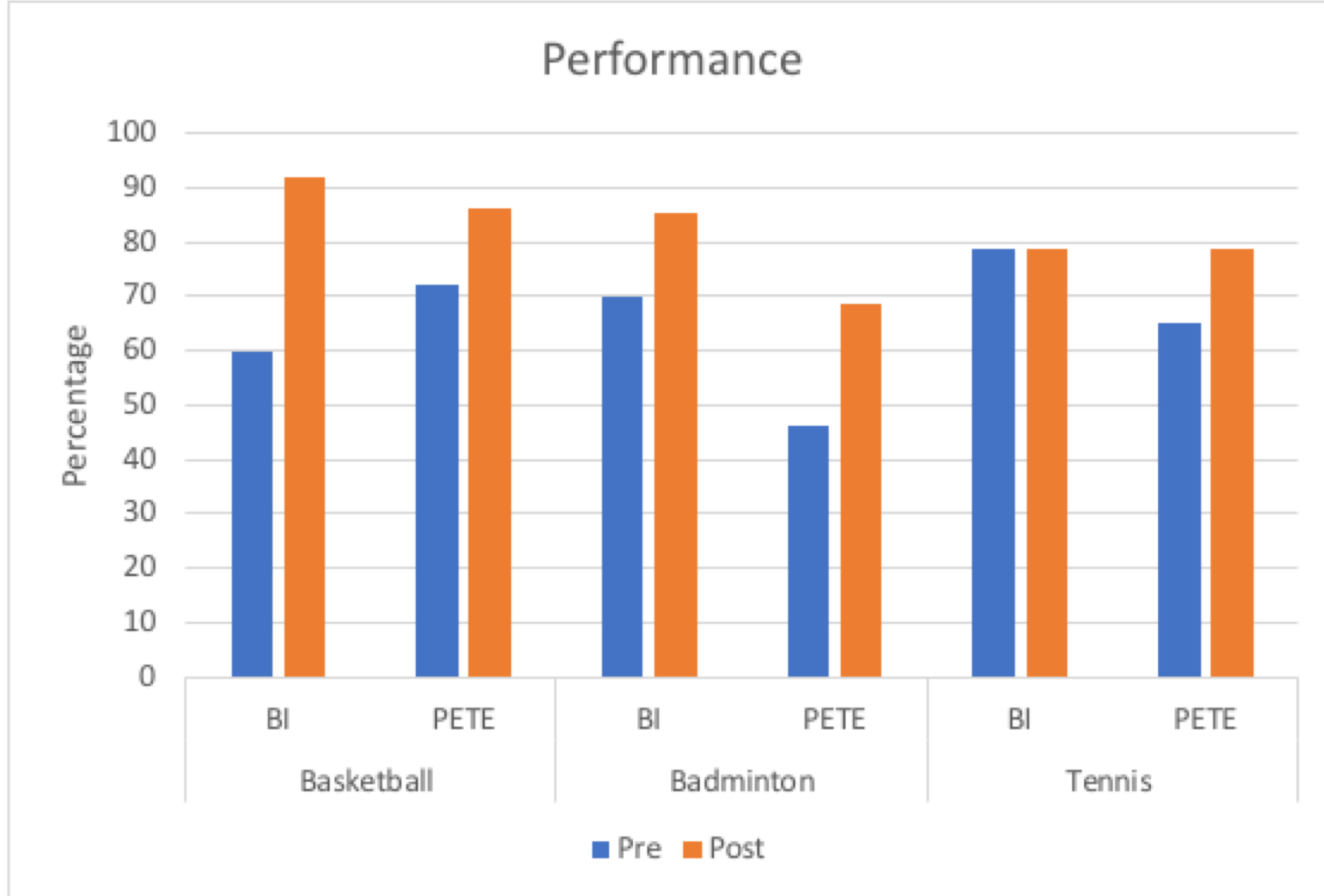
Tennis

- CCK (18%) and SCK (1.33)

Pre- to Posttest differences CCK

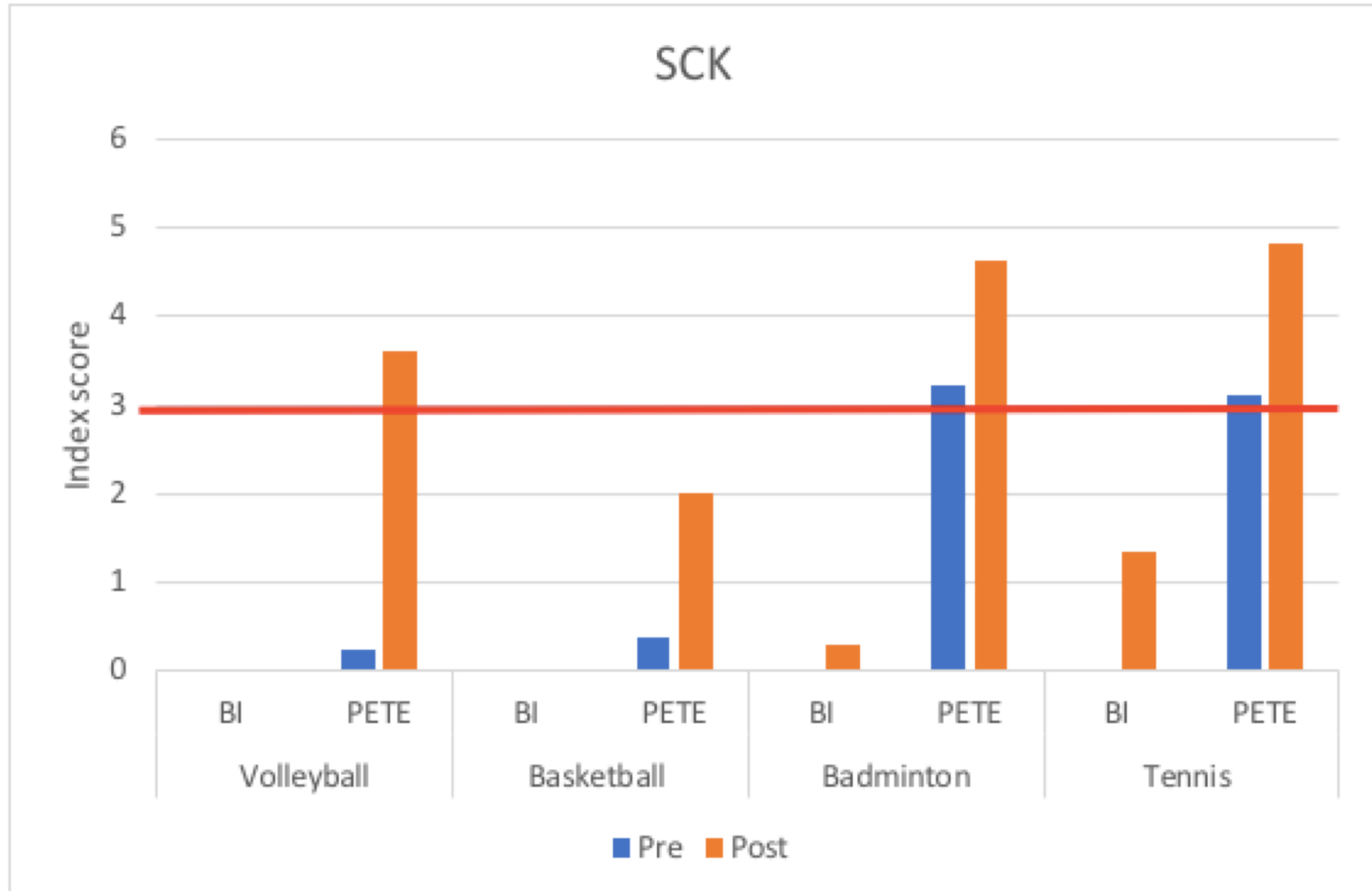


Pre- to Posttest differences Performance



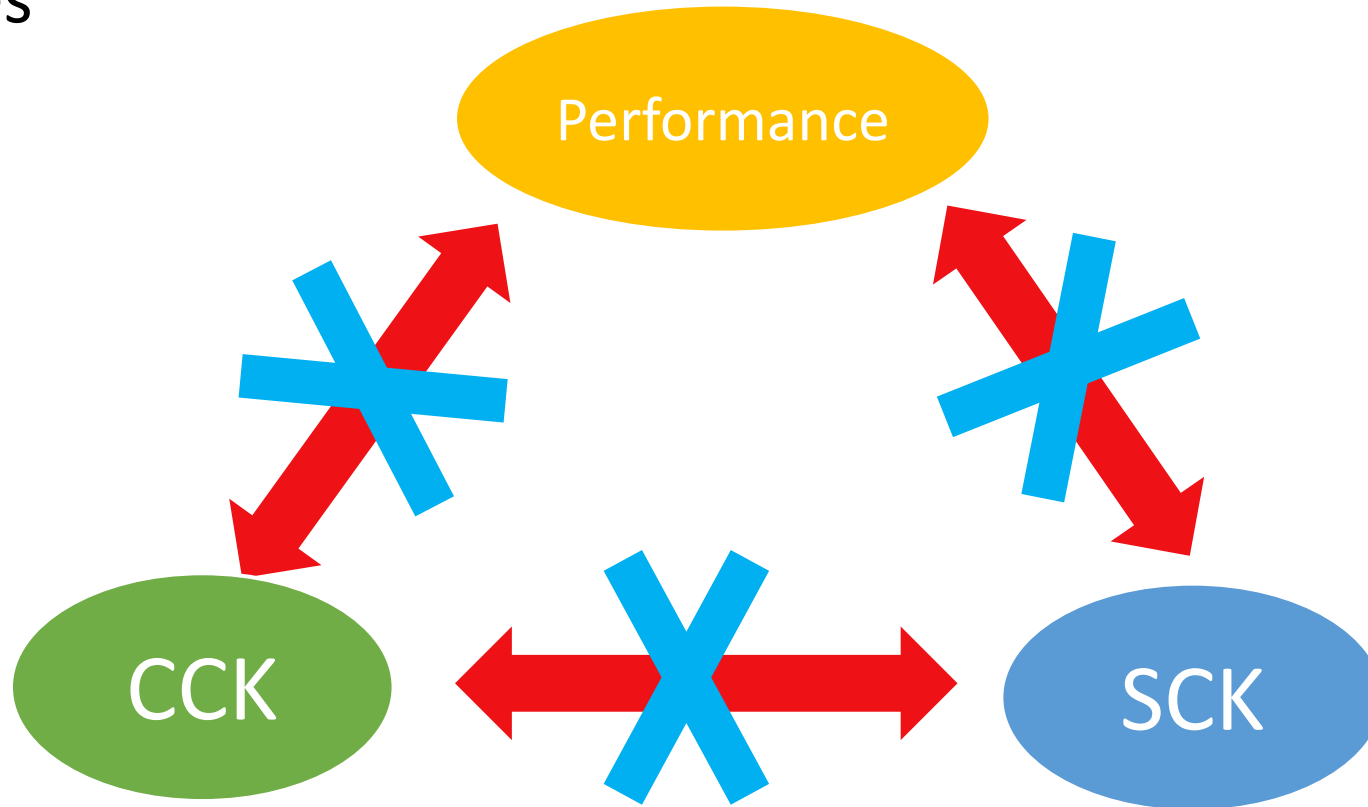
Note. Volleyball pretests were not able to be gathered from all classes so it was not analyzed

Pre- to Posttest differences SCK



Relationships between CCK, Performance, and SCK

- No significant correlations were found between CCK, Performance, or SCK scores



Findings



- Both groups generally improved in CCK and performance
 - PETE group had half the contact time per sport and made similar gains
- SCK increases were much larger in the PETE group than in the Basic Instruction group
- PETE group who had been through a teaching course the year before (on different sports) had higher SCK scores on the pre-test

Discussion

Demographics

- Increased playing and teaching experience increase CCK (though not meaningfully) and performance scores but not SCK
- Hypothesis that K-12 experience does not increase SCK was supported



CCK and Performance Pre to Posttest

- Can be increased by basic instruction courses focused on performance
- Can be increased in a PETE course focused on how to teach skills even with half the contact time as Basic Instruction courses

SCK Pre to Posttest

- Is not increased in Basic Instruction courses
- Can be significantly increased by PETE courses with an SCK focus
 - SCK should be specifically taught to teachers



Limitations

- Small sample size that does not allow for some statistical analyses
- One university sample and does not represent other universities
- CCK and Performance tests were content valid but we do not have any other form of validity

