



THE OHIO STATE UNIVERSITY

A critical review of content knowledge research
in physical education:
Accomplishments and challenges

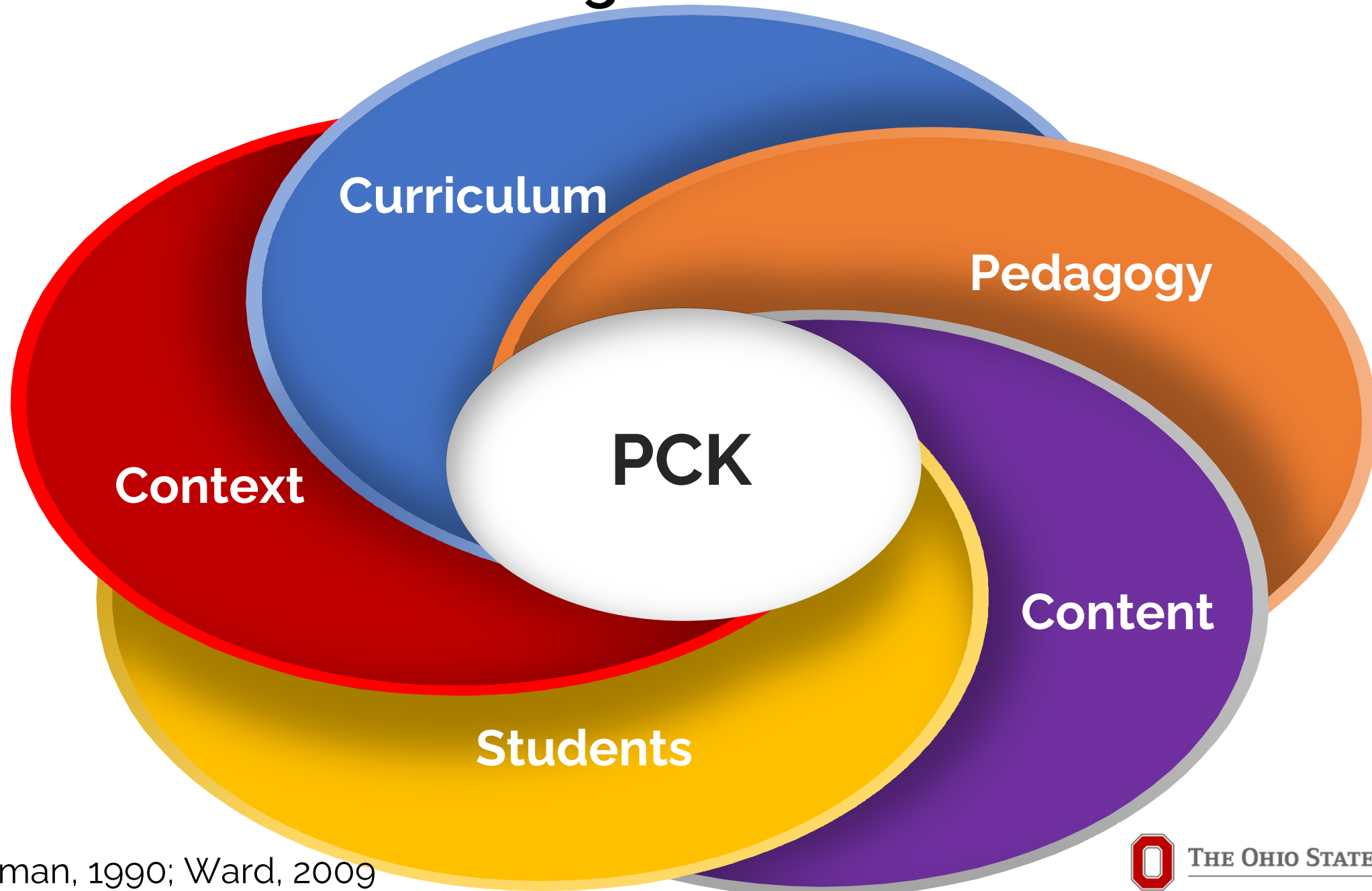
Phillip Ward

Definitional Clarity

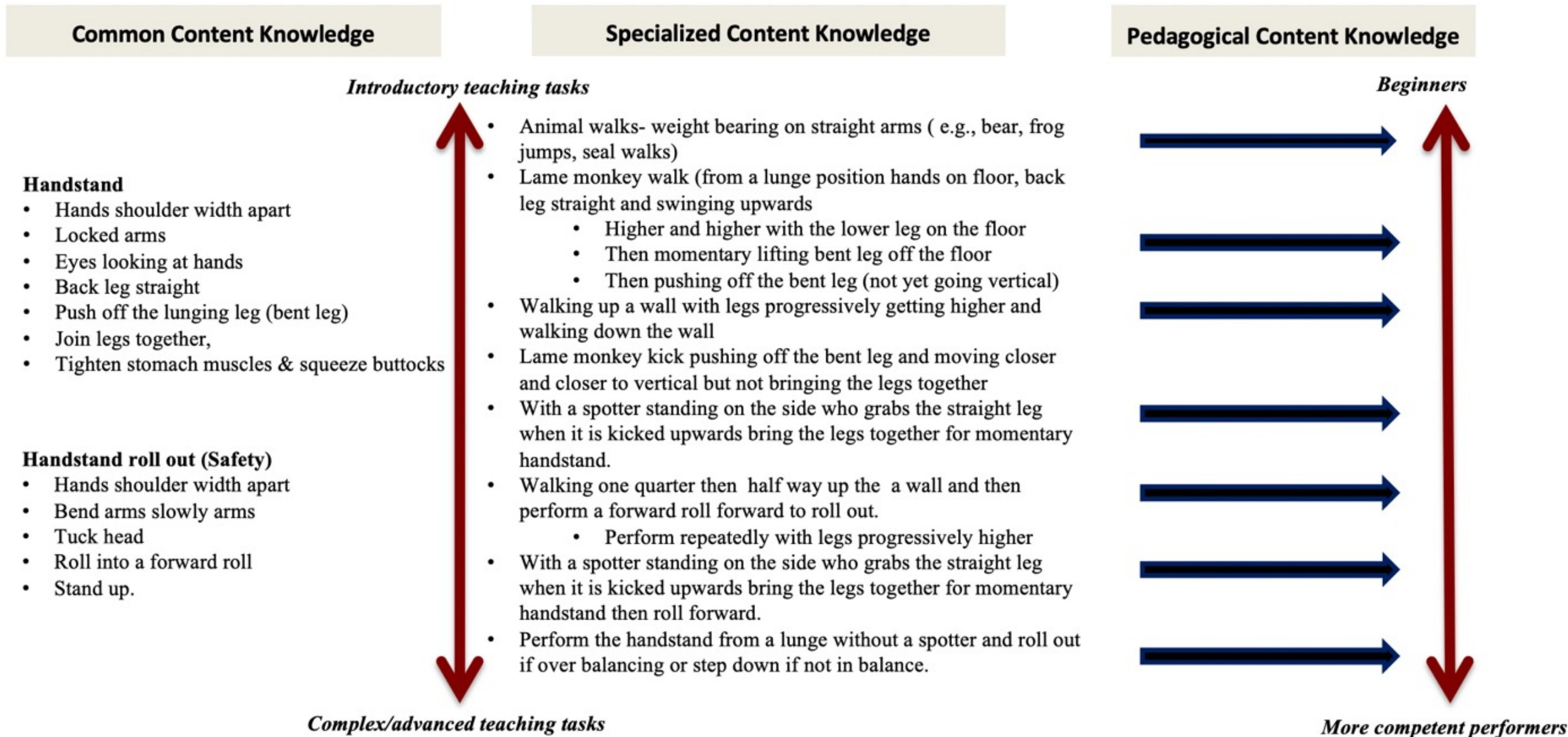
- **Common Content Knowledge (CCK)**- The knowledge needed to perform.
 - Knowledge of Etiquette, Rule and Safety
 - Knowledge of techniques
 - Knowledge of tactics
- **Specialized Content Knowledge (SCK)**- The content knowledge needed for teaching or coaching.
 - Knowledge of how the task is represented
 - Knowledge of the task to be used to teach
 - Knowledge of the errors that students might make when they perform the task
- **Common Content Knowledge as Performance (CCK-P)**



The knowledge bases that inform PCK



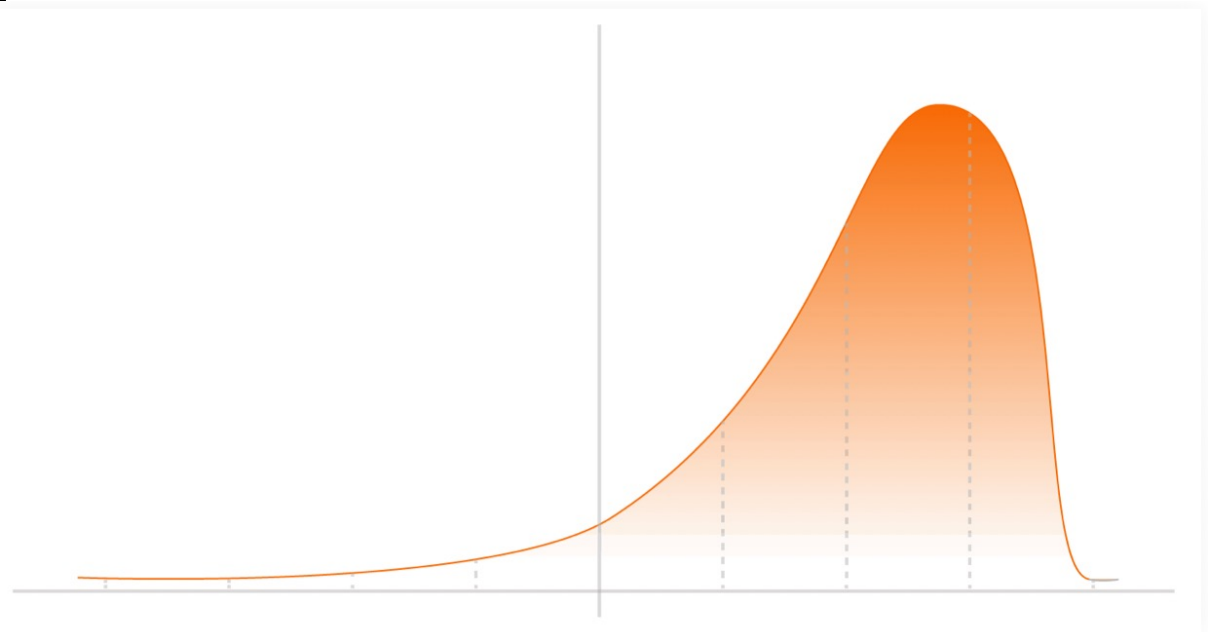
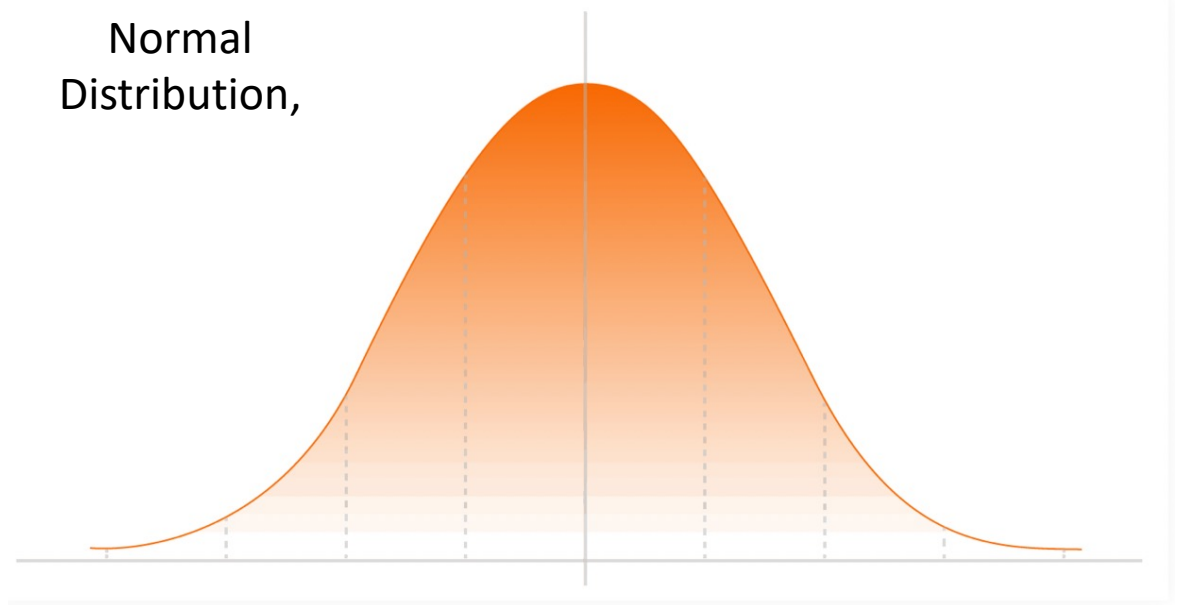
The relationship of CCK, SCK to PCK for Gymnastics



The impact on students of improved content knowledge in pedagogical content knowledge

- 1-2 Standard deviations
 - Meeting Bloom's (1984) two Sigma Challenge for education research.

Normal Distribution,



The evolution of our understanding of teacher content knowledge

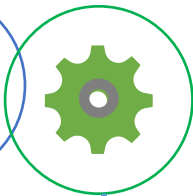
Book of CCK Tests
for students and
PSTs

Tsuda et al., 2021



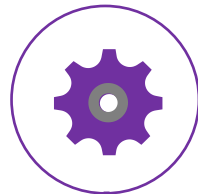
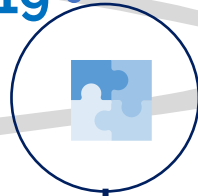
Measures of CCK
performance

Tsuda, 2019



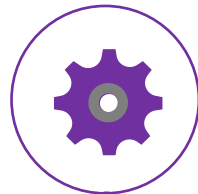
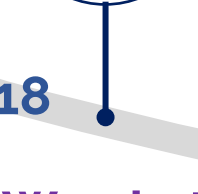
Derwent et al., 2018

The development of measures of
CCK – mostly using Rasch
methodology.



Improving the
CCK SCK of PST's

Ward et al., 2018



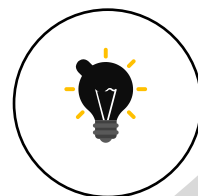
Development measures of SCK

Ward et al., 2015

Borrowed from Ball et al., 2008: CCK & SCK,
and their sub-domains in physical education

Multiple sub-domains of
content knowledge.

**Ball, Thames & Phelps,
2008**

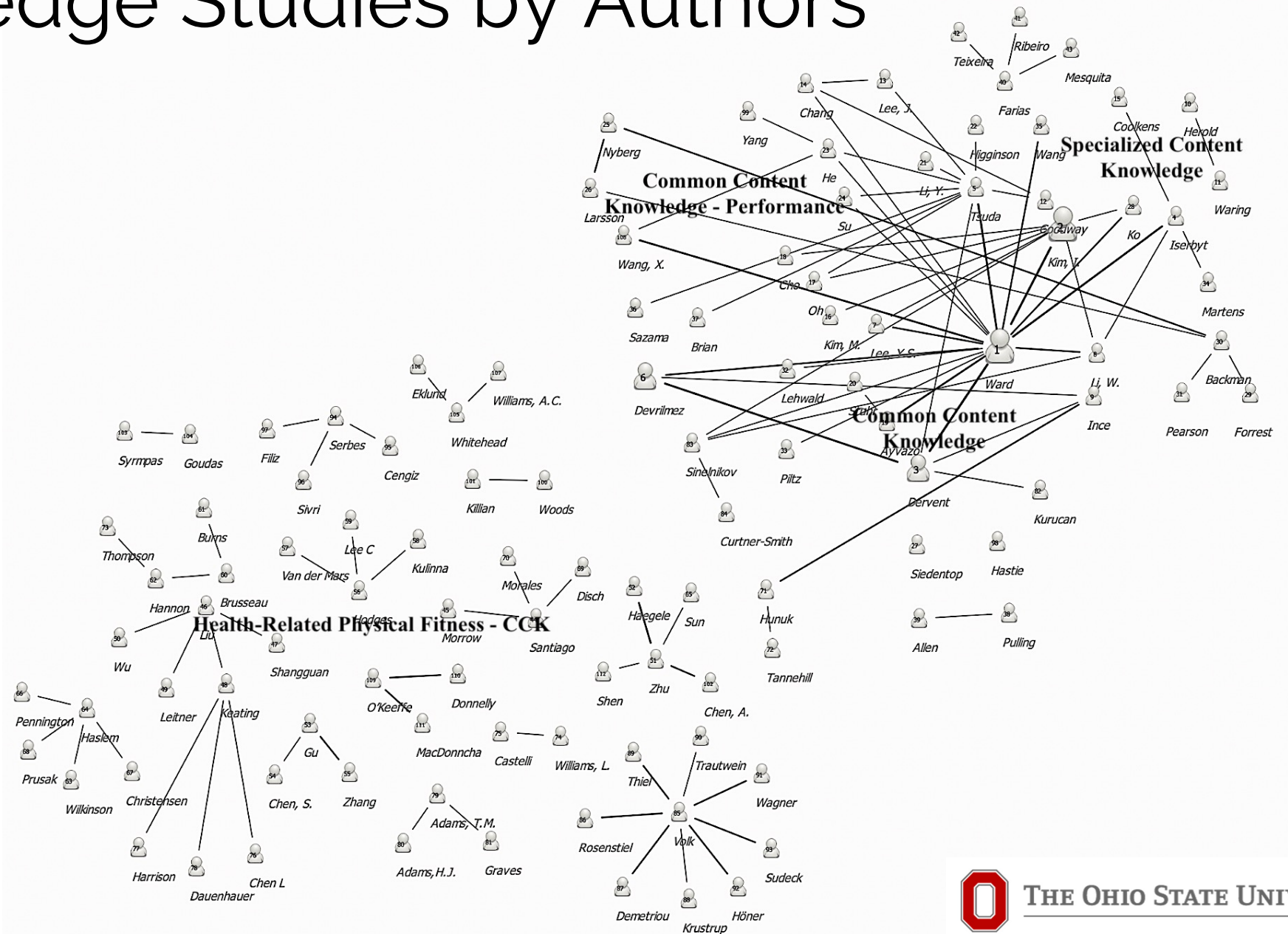


The role of content knowledge in studies of
teaching effectiveness and the proposal of PCK

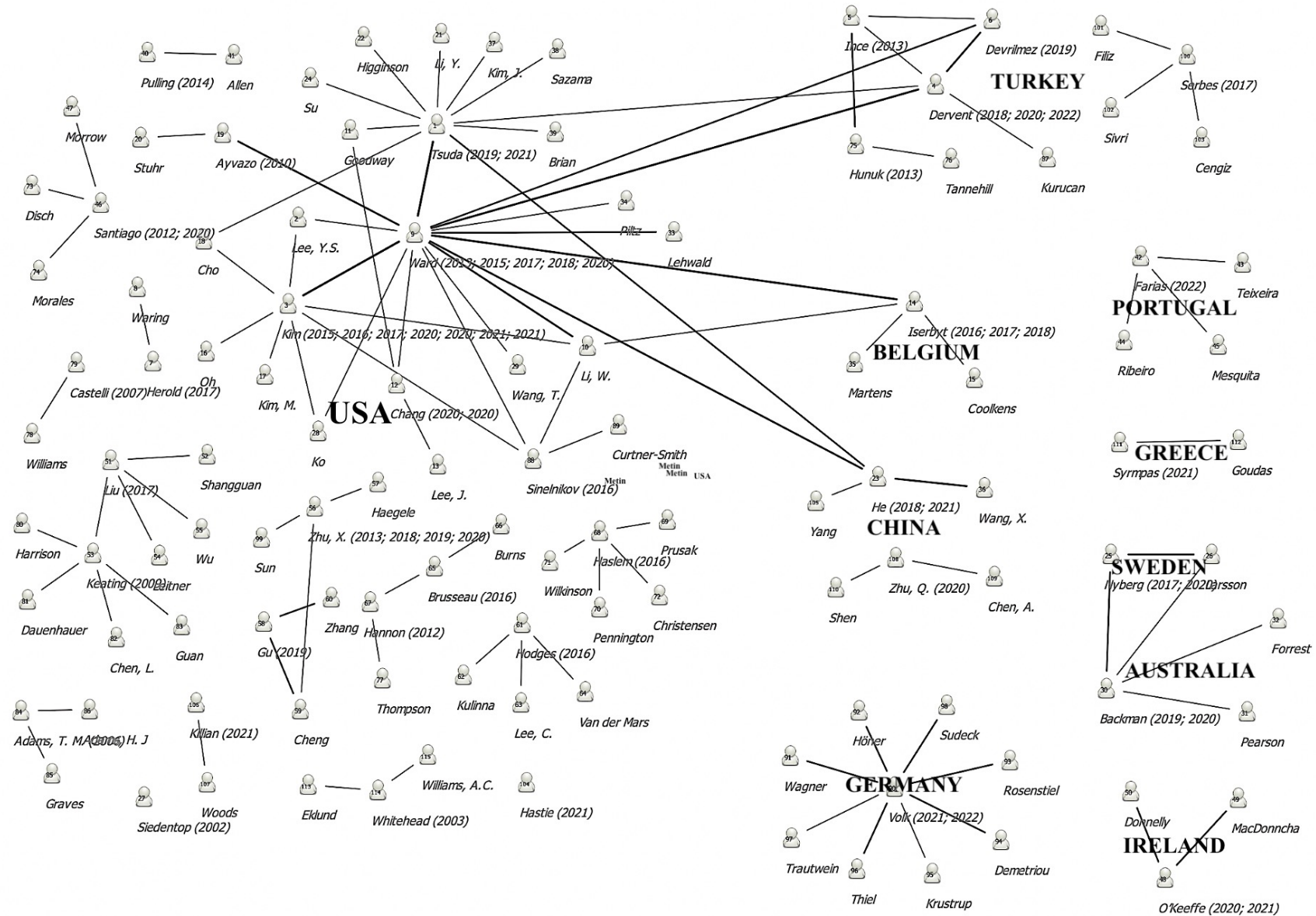
Shulman 1986/1987



Social Network Analysis of Content Knowledge Studies by Authors



Social Network Analysis of Content Knowledge Studies by Countries Where the Studies were Conducted



Content Assessed to Date

For Secondary School Contexts

- Basketball,
- Volleyball,
- Soccer,
- Badminton,
- Tennis,
- Gymnastics,
- Softball,
- Flag football,
- Basic life support skills

For Elementary School Contexts

- Locomotion,
- Throwing and ball skills, and
- Gymnastics



What do we know about CCK

- Health-related fitness CCK has been examined across the last three decades (e.g., Castelli & Williams, 2007; Miller & Housner, 1998; Santiago & Morrow, 2021), and the data show that after taking several exercise sciences course, both PST and practicing teachers seldom score above 60% on multiple-choice tests.
- Movement CCK preservice teachers AND most undergrads we have assessed in other majors enter the University with scores between 40% and 60%. These scores are the product of physical education and extracurricular experiences.
- Preservice teachers typically gain 20% more from teacher education instruction moving them to 60-80%, which would give them failing grades to B's in a typical University grading system.
- Some recent studies have shown improvements in CCK using different approaches (e.g., Tsuda et al., 2019).
- Playing and coaching experience has a small to medium effect on entry scores-but only on 1-2 content areas. Teaching less so.

For summaries of these data, see Hastie, 2021; Santiago & Morrow, 2021; Ward et al., 2020.



What do we know about SCK

- Studies measuring the SCK have shown that pre-service teachers and undergrads, in general, acquire very little SCK from their K-12 and extra-curricular experiences prior to entering teacher education programs (Derwent et al., 2020; Tsuda, Ward, Li, et al., 2019).
 - Typically, these students enter programs with SCK index scores between 0 and 1.5.
- This result is consistent with the SCK hypothesis (Ball et al., 2008; Ward, 2009). SCK is a kind of knowledge that is not acquired unless you are an instructor, and then only if SCK is specifically taught –performers would not need to know SCK, and so it is understandable that scores are low.
- Most PETE programs we have examined do not devote much time to SCK in their PETE programs and typically graduate preservice teachers with SCK index scores below 2.0 and with little understanding of the instructional tasks in content areas (Derwent et al., 2020; Tsuda, Ward, Li, et al., 2019). The result is that many teachers tend to use mostly informing and applying tasks with some refining tasks.
- SCK is not acquired across the career of a teacher, just through experience (He et al., 2018).
- When teachers learn to use SCK meaningfully, learning gains for students typically exceed effect sizes of 1.0 (e.g., Chang et al., 2020; Kim et al., 2018; Stefanou et al., 2021).

What do we know about CCK-P

- Performance is necessary, at the very least, to provide demonstrations of the content.
- Performance varies between 40 and 85% at entry to university, depending on the sport and the student's learning history as a player (Tsuda et al., 2019; Ward et al., 2018).
- Performance typically improves to 60-80% unless it is already at or above 80%.



What do we need to learn about CCK?

- Is CCK retention of less than 60% the result of ineffective teaching, a lack of teachers CCK who teach these content areas, or short duration units that allow little opportunity to learn the subject matter or some other explanation?
- We need empirical evidence of better ways to teach CCK.



What do we need to learn about SCK?

- We need empirical evidence of better ways to teach SCK.
 - Recent studies by Hastie and colleagues in China provide and by Tsuda et al. 2019 and Ward et al. 2018) provide some examples but we need much more research on how to teach SCK.
- Within SCK we have focused very hard on using instructional tasks and much less so on task representations to students and in particular knowing the errors and misunderstandings that students might make.
- Should we try to teach as much SCK as possible or perhaps teach a model invasion game, a racquet sport, and individual activity really well and provide opportunities for generalization (i.e., transfer).



What do have to learn about CCK-P

- We do not know how good a performer you need to be of the content to be **an** effective teacher.



dreamstime.



What we need to know more about relationships among CCK, SCK, and CCK-P-Currently...

- When CCK is high or low, it isn't related strongly to SCK.
- We have some very small indications that make sense that when SCK is high, CCK is also high.
- CCK is moderately related to CCK-P, but it depends greatly on the CCK-P score.
- Most studies show that CCK and SCK are often low –not much to make of that, except they are low. But the conclusion is to treat (not teach) these somewhat as discrete response classes.



In summary...

- Research on content knowledge has very large data base in more than 12 countries that provides a good indication of the similarity of the problems faced by preservice teachers and practicing teachers and of the utility on
- Many accomplishments including operational definitions, measurement instruments, interventions for preservice teachers and practicing teachers.
- However, there is a lot to do to help preservice teachers and practicing teachers acquire content knowledge.



Important summary and review papers

- Hastie, P. (2021). A primer on content knowledge in physical *Education Research*, 41, 165–170.
- Ward, P., Ayvazo, S., Dervent, F., Iserbyt, P., & Kim, I. (2020). Instructional progression and the role of working models in physical education, *Quest*, 72, 410-429.
- Ward, P., & Ayvazo, S. (2016). Pedagogical content knowledge: Conceptions and findings in physical education. *Journal of Teaching in Physical Education*, 35, 194-207.
- Ward, P. (2009). Content matters: Knowledge that alters teaching. In L. Housner, M. Metzler, P. Schempp and T. Templin. *Historic Traditions and Future Directions of Research on Teaching and Teacher Education in Physical Education*. (pp. 345-356). Fitness Information Technology.





Thank you for your time today



- This PPT will be on the *Learning to Teach Physical Education Research Program* website (<https://u.osu.edu/ltpe/>) on Monday.
- I can be contacted at ward.116@osu.edu