Assessing Levels of Student Understanding in Teacher Education Using A SOLO Taxonomy

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What was the initial problem?

• The lack of conceptual understanding of the Teaching Games for Understanding (TGfU) curriculum instruction model.
• A two-cycle SOLO approach was chosen to describe the varying levels of student understanding of this concept.
What does the literature say about the implementation of TGfU?

- Randall (2003) explored the degree to which pre-service secondary physical education teachers understood the TGfU approach as an alternative to their previous PE games experiences from a constructivist learning perspective.

- Fundamental misunderstandings exhibited by these pre-service included “The Dual Nature of TGfU” (i.e. Teaching skills and tactics concurrently in a game context. Not the traditional Skill/Practice/Game approach) and “The Role of Planning” (i.e. Viewing lesson planning as unnecessary).
What does the literature say about the profile of PE teachers?

• Numerous studies (Hargreaves, 1977; Nettleton, 1985; Templin & Schempp, 1989; Dewar, 1989) have attempted to understand the ‘nature’ of the PE teacher. More recent Australian studies (MacDonald et al., 2002) have concurred with their international colleagues in describing PE teachers as elitist, sexist, ‘pragmatic sceptics’ and ‘anti-intellectual’.

• Other studies (Kirk & Colquhoun, 1989; Gard & Wright, 2001) go further to suggest that many PE teachers uncritically accept certain assumptions that underpin ideologies derived from clinical literature and therefore dismiss those that would be seen as constructivist or pragmatic.

• This profiling of PE teachers obviously raises concerns as to the extent to which they will be capable, or even willing, to accept changes in PE curriculum that are driven by a constructivist paradigm.
The challenge of developing deep learning, as opposed to surface learning, by constructing game related problems and utilising questioning techniques was a major focus. Therefore

- The unit entailed three pieces of constructively aligned assessment.
- Practicum sessions were TGfU focused and derived largely from the lecturer’s experience and knowledge of TGfU application.
- Submitted assignments were focused on the deep knowledge required to implement TGfU into classroom practice.
- Students were required to research obscure sports and demonstrate an in-depth knowledge of the sports culture, history, development, curricular links, and most importantly, how to instruct using the TGfU principles within a school environment to years 7-10.
- Final examination design
5 levels of response
Prestructural: ‘I know nothing’
Unistructural: ‘I know one relevant thing’.
Multistructural: ‘I know a lot of relevant things’
Relational: ‘I know how a lot of relevant things fit together.’
Extended Abstract: ‘There’s more to this question than meets the eye.’
Boulton-Lewis (1998)

‘.. in discipline areas that are new to them some students may only be performing in the concrete-symbolic mode .. They are memorising words and concepts (perhaps understanding them) and relating them to concrete situations, organising them perhaps at the relational or extended abstract level in that mode but are not really able to theorise about the ideas.’
• Chan, Tsui, Chan & Hong (2002)

**Problem**: ‘The conceptual ambiguity of SOLO’S structure makes categorization unstable along with the problem of low inter-rater reliability.’

**Solution**: Add more sublevels to SOLO at M and R levels.
• Research based on development of conceptual understanding in secondary Mathematics and Science
• Large student samples
• At least two cycles of response - ie not the same thing happening at different levels but different things happening.
First Cycle SOLO

- Vital to learning
- Understanding at factual level
- Narrative and/or Descriptive
- Student fits new knowledge into existing schema
- Low on metalanguage
- ‘Not in the game’
Second Cycle SOLO

- Understanding at conceptual level
- Expositional
- Student participates in the ‘way things are done around here’.
- High on metalanguage
- ‘Enters the world of the game and begins to play’
2-Cycle SOLO (After Pegg, 2002)

Concrete Symbolic Mode

Formal Mode
Methodology

- Sample
- Three assessment items
- Reporting of part of Assessment 3
- Exam conditions
- Double blind marking with consultation on criteria and negotiation on contentious grades
Assessing for Conceptual Understanding

- Relationship between components
- AWM question
- “In as much detail as possible”
- Applied nature of higher order question
- Limited scaffolding (Dangers of over scaffolding)
You are being interviewed for a position as a PDHPE teacher at a school that is about to organise its Stages 4 and 5 curriculum on the principles of Game Sense/Teaching Games for Understanding (TGfU)

Q1(a). Describe the Games Classification System. Ensure you include examples of games that fall into each category.

Q1(b). In as much detail as possible, explain the pedagogical principles associated with teaching this model.

Q2. State your understanding of the TGfU model, in as much detail as possible. Why does it provide a sound basis for teaching physical education?
Student Responses at each level (1st Cycle SOLO)

“TGfU has six stages

• Game-Learner
• Game Appreciation
• Tactical awareness
• Making appropriate decisions
• Skill execution
• Performance

• “Game-learner is for the students to be introduced to the game and how to learn the game.... Game appreciation involves learning the rules of the game and how it is to be modified... Tactical awareness are the tactics that are being used in the game...”
“This model includes:

- **Game-Learner:** Game is introduced, should be modified to meet the structure level of the advanced form of the game and developmental abilities of the players.
- **Game Appreciation:** Understanding of the rules that are included in the game (boundaries, scoring).
- **Tactical Awareness:** Consider the tactics of a game that will help work through achieving the games goals and also help with principles in game situations.... In this approach the students learn the structure of the content and their relationships which comprise these concepts. *Thus enabling students to transfer their knowledge from game to game.*"
“The Teaching Games for Understanding (TGfU)/Game Sense model is an effective tool in engaging students in the content of subject being taught...”

“The TGfU model is a student centred approach to teaching sport/games. The game sense model teaches students through game appreciation and skill development rather than teaching students the basic skills of the game in isolation.”
“The TGfU/Game Sense model is designed to not just teach students skill acquisition but to also accompany these skills with an ability to understand their tactical situational attributes during a game. This encourages students to become thinking players and promotes problem-solving and communication skills with physical education”... TGfU is a student centred model that lets the students construct their own knowledge by the teacher facilitating their learning. If students feel they are more competent and confident within a sporting climate they are more likely to participate in sport outside of school therefore this model promotes lifelong physical activity.”
TGfU is a conceptually-based approach to PDHPE instruction that focuses on providing meaningful sporting experiences through the development of tactical awareness in game-like...skill development is not abdicated from the games sense model, rather it is taught in the context of game based situations to provide relevance and meaning to skill development...

According to Dewey we never educate directly but indirectly through means of the environment, which reinforces the approach of games sense to approach PE instruction through a student-centred leaning environment...In this way, games sense is similar to constructivism in generating learning through ones environmental knowledge, therefore emphasising reasoning behind modified games to represent their environmental tactical problems...four distinct categories based on their similarity in tactical problems and complexity
Conclusions

- Support of Pegg’s two-cycle SOLO approach for assessing the quality of conceptual understandings in physical education teacher education courses.
- Important feedback concerning the design and grading of tertiary assessments by articulating the cognitive pathways exhibited by students with varying levels of conceptual understanding.
- Support Boulton and Lewis’ (1998) contention that tertiary students grappling with new concepts revert to the concrete symbolic mode as their understanding develops.
- Pegg’s (2003) two-cycle SOLO approach describes this process and provides insight into assessment and teaching/learning processes appropriate for developing new conceptual understandings in pre-service teacher education courses.