

# Clearing-Up the Measurement Confusion Regarding Student Attitudes Toward Science & a YEC Worldview

10/7/2006



# Need to do

- Some more research on items and one more comparison chart with the Lawson items and some of the others
- Do a literature search for any current measurements and add this to the presentation.
- Review it one more time – divide it up regarding who will present what.

# Part I: Setting the Stage

## Science & Measuring Things

- Science is the art of measuring things.
- The social sciences deal with the question of how to measure abstract things, such as attitudes & beliefs?
- Since attitudes & beliefs are not observable or tangible, how do we go about measuring them?
- The personal worldview that the scientists and the students subscribes to (or holds) effects the way one goes about measuring things



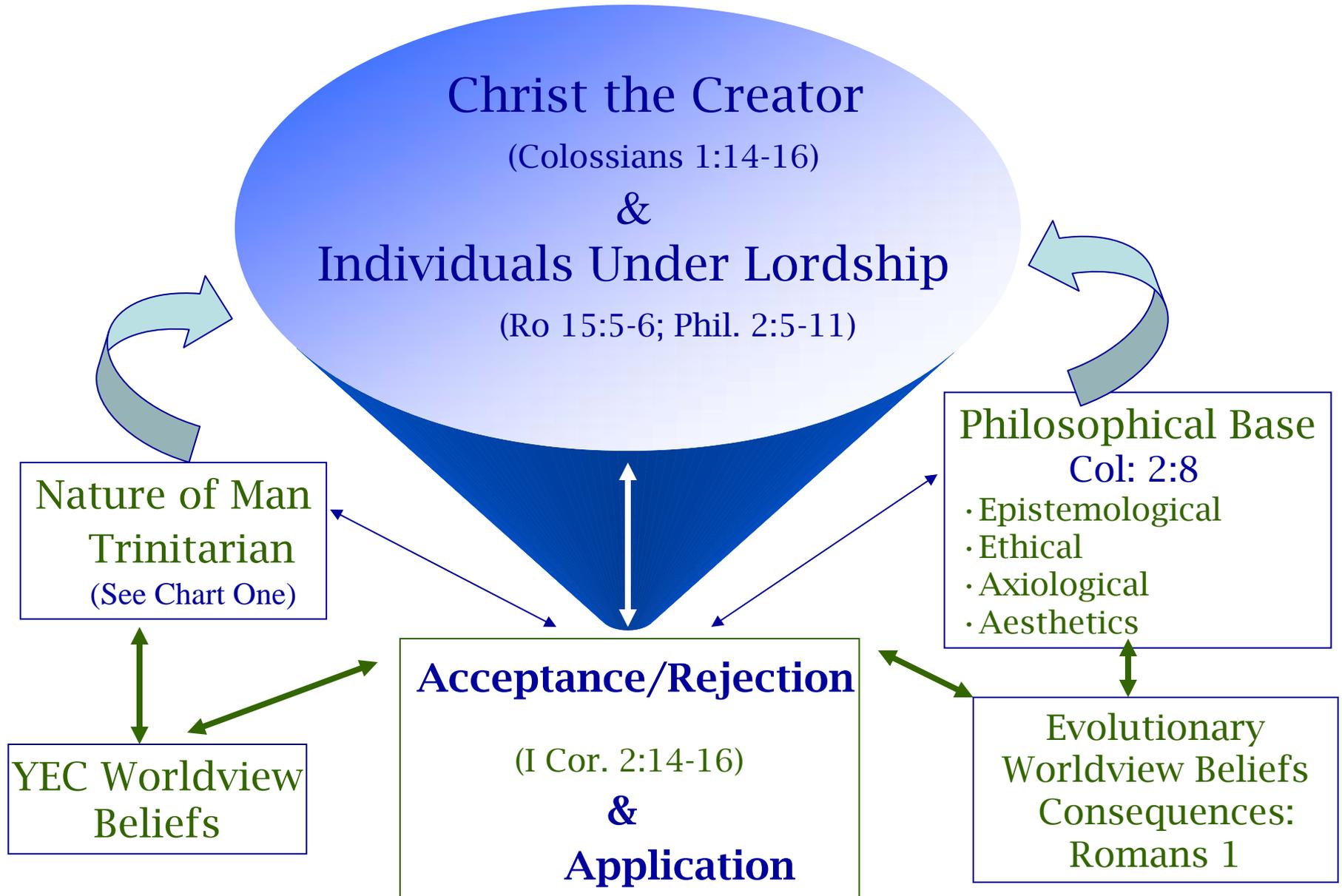
# The Problem

- Creationism/evolution – which do we believe? Which do we teach?
- Clearly two perspectives
- Evolutionary perspective – typically something like this: (Next Slide)
- Creationist Perspective

# Evolutionary Perspective

“Evolution- To believe it or not to believe it? To teach or not to teach the biblical account of creation? This question has not been stilled even though Darwin’s *Origin of the Species* was published almost 150 years ago. The theory of evolution has long been fundamental to biological sciences and is now basic to the newer fields of sociobiology and evolutionary psychology. Yet today, 75 years after John T. Scopes was convicted of breaking the Tennessee law prohibiting the teaching of evolution, conflict between the biblical account of creation still persists” (McKeachie, Lin, & Strayer, 2002).

# Worldview Model Components

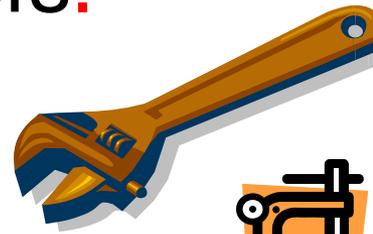
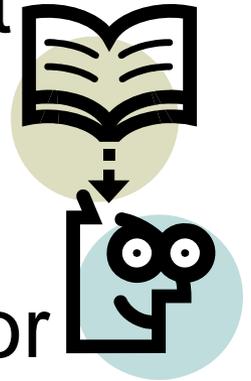


# Measurement of Worldview

- Worldview is a construct.
- Constructs can be measured, however they are abstract and there are measurement difficulties.
- A construct is a collection of abstractions generally conceptually in nature.

# The art of measuring abstractions

- Social scientists (educators) construct instruments for collecting information about abstractions.
- Such instruments are called surveys or scales (the tools of the trade).
- Scales are used to measure abstractions such as attitudes or beliefs.



# Part II: Methods & Related Items

- Scales must be validated.
- Validity means – does the instrument measure what it is supposed to or said to measure?
- For example: the ***Creationist Worldview Scale (CWS)***.
- Does it truly measure a Creationist Worldview?
- How do we know that it does?
- The same can be said for other scales.

# Validity and Scales

- Another example:
- The **M**easure of **A**cceptance of the **T**heory of **E**volution (MATE). Does it measure acceptance of the theory of evolution?
- How do we know?

# Part III:

## The Instruments

- Creationist Worldview Scale (CWS)
- Reliability has been carefully established.
- Peer reviewed
- PEERS and CWS  $r = .89$
- Validity has been established.

	Sample CWS Items	SA	TA	N	TD	SD
1	Space, time and matter have always existed and were not created.	1	2	3	4	5
2	Biological life came from non-living matter by chance.	1	2	3	4	5
3	Biological life developed by a series of natural processes.	1	2	3	4	5
4	Genetic mutations have caused beneficial changes in living things.	1	2	3	4	5
5	The rocks and fossils show that the earth is millions of years old.	1	2	3	4	5
6	Great quantities of sedimentary rock layers and fossils were deposited by a worldwide flood.	1	2	3	4	5
7	It is appropriate in scientific studies to consider creation.	1	2	3	4	5
12	All things in the universe were made by God in six twenty-four hour days.	1	2	3	4	5
13	Dinosaurs and man lived at the same time.	1	2	3	4	5
14	God created land dinosaurs on the sixth day of creation.	1	2	3	4	5
17	Formation of sedimentary layers and canyons caused by the eruption of Mt. St. Helens supports a creationist model.	1	2	3	4	5
18	The Creation model and the Second Law of Thermodynamics are compatible.	1	2	3	4	5
19	Man has taken millions of years to get to his present form	1	2	3	4	5
27	In modern geology the present is the key to the past is an established fact.	1	2	3	4	5

# Comparison of how Creationist/Evolutionist would answer specific items on the CWS

Item	CR	ER
Space, time and matter have always existed and were not created.	1	5
Biological life developed by a series of natural processes.	1	5
The rocks and fossils show that the earth is millions of years old.	1	5
Great quantities of sedimentary rock layers and fossils were deposited by a worldwide flood.	5	1
It is appropriate in scientific studies to consider creation.	1	5
All things in the universe were made by God in six twenty-four hour days.	5	1
Dinosaurs and man lived at the same time.	1	5
God created land dinosaurs on the sixth day of creation.	5	1
Formation of sedimentary layers and canyons caused by the eruption of Mt. St. Helens supports a creationist model.	5	1
Man has taken millions of years to get to his present form	1	5

Likert scale favoring creationism 1-5 with 5 = to SA

# MATE Background

- Rutledge, M. L., (1999). The development and validation of the measure of acceptance of the theory of evolution instrument. *School Science & Mathematics, 99*(1)
- Rutledge, M. L., and Warden, M. A. (2000). Evolutionary theory, the nature of science & high school biology teachers: Critical relationships, *American Biology Teacher, 62*(1), 23-31.

# Mate (Cont.)

- A biology teacher's acceptance or rejection of evolutionary theory as a scientifically valid explanation is potentially important to the role that evolution takes in the high school biology curriculum. Due to the nature of available instrumentation, our understanding of teacher acceptance of this complex overreaching biological theory may be incomplete or confounded. This paper describes the development and validation of the Measure of Acceptance of the Theory of Evolution (MATE)--a 20-item Likert-scaled instrument that assesses teachers' overall acceptance of evolutionary theory. Chronbach alpha reliability of the MATE is also reported.

# MATE (cont.)

- Note the progression
- Development and Validation (1999)
- Used in joint research (2000)
- Warden is Assoc. Prof of Biology at BSU
- Rutledge is Asst. Prof of Biology at Middle Tennessee State University

# Reliability & Attitudes & Beliefs

- Reliability is about consistency. In other words, does the scale consistently measure what it is supposed to measure?
- For example, does the CWS give similar results over multiple testings of the same subject?

# Sample of MATE Items

- Organisms existing today are the result of evolutionary processes that have occurred over millions of years.
- The theory of evolution is incapable of being tested scientifically.
- Most scientists accept evolutionary theory to be scientifically valid theory.
- The age of the earth is less than 20,000 years.

# Comparison of how Creationist/Evolutionist would answer specific items on the MATE

Item	CR	ER
Organisms existing today are the result of evolutionary processes that have occurred over millions of years	1	5
The theory of evolution is incapable of being tested scientifically	5	1
Most scientists accept evolutionary theory to be scientifically valid theory	3	5
The age of the earth is less than 20,000 years	4-5	1

Likert scale favoring evolution 1-5 with 5 = to SA

# Reliability

- To **establish the reliability of the MATE**, the instrument was administered to public high school biology teachers in the state of Indiana.
- For the 1994-1995 academic year, Indiana's public high schools employed 1,039 biology teachers.
- Fifty teachers were utilized in the initial field-testing of the MATE and were, therefore, unavailable for participation in the study itself.
- A total of 552 completed instruments were returned--a response rate of 53%. A reliability coefficient was calculated using the internal consistency method proposed by Cronbach (1951).

# Reliability

- Scales for reliability coefficients, like the Cronbach alpha, range from 0 (indicating no reliability) to 1.00 (indicating perfect reliability). Reliability of the MATE was found to be .98.
- Item analysis revealed each of the 20 items to have a corrected item total correlation of greater than  $r = .65$ , suggesting that each item contributed to the overall reliability of the instrument (Table 3).
- One of the desirable aspects of the Cronbach alpha technique of determining reliability is that it has proven to be a conservative measure, yielding lower reliability coefficients than would be obtained by using other methods (Borg, Gall, & Gall, 1993). Thus, it can be thought of as providing a minimum estimate of overall reliability.

# Part IV: Recent Study at LU

- Students at LU in the required undergraduate Creation/Evolution course were pre-tested and post-tested using a modified version of the CWS.
- The modifications included the inclusion of scale items from two other scales.
- These were items from the MATE and a unnamed scale from the work of Lawson & Worsnop (from here forward called the Lawson scale).

# More on the Context of the Problem

- Creationism is misunderstood by the secular scientists and science educators, and they label it incorrectly.
- Example:
  - Pseudoscience
  - Biblical Literalism

Psychic Powers, Astrology, and Creationism in the Classroom, ABT 1990.  
Eve & Dunn

# Psychic Powers, Astrology & Creationism in the Classroom

## Eve & Dunn

- Survey of teachers beliefs about these items
- Interesting that the greatest support was for the items they labeled as Biblical literalism
- Example: Adam and Eve were the first humans beings and were created by God
- 45% definitely true to probably true

# Pseudoscience (Continued)

- Statistics used support truth.
- Biblical literalism came out as one of the factors that was important.
- The non-biblical factors did not cohere (did not produce any meaningful factors).
- Important conclusion: “only the biblical literalism type of pseudoscientific belief is specifically hostile to mainstream science” (read evolutionary based).
- It was said to cohere and manifest itself as a complete worldview (p. 16).

# The Problem in more detail

- Lawson and Worsnop (1992) surveyed high school biology students
- An attempt to assess special creation, evolution and other beliefs The survey (instrument) consisted of seventeen items, nine for measuring beliefs about special creation.
- Among these items were:
  - Fossils were intentionally put on the earth to confuse humans.
  - Living organism are different from nonliving things because they possess some kind of special force or spirit.

# Let's examine these one at a time

- Fossils were intentionally put on the earth to confuse humans.
- A YEC is supposed to agree with this question.
- You can see this creates a problem – since YEC's will not agree with this.

# Likert Scale

- The instrument used to measure these beliefs was a five point Likert scale (strongly agree to strongly disagree).
- The previous item was supposed to measure a belief in special creation.
- A knowledgeable YEC would answer this question in a manner similar to that of the evolutionist.

# More Items

- Living organisms are different from nonliving things because they possess some kind of special force or spirit.
- Same problem here-
- Thus this is a flawed instrument.
- Thus Lawson's conclusions will be flawed.

# What did Lawson & Worsnop Conclude?

- That creationist were not able to reason well.
- That creationism is a non-science belief that should be rejected.
- That those who believe evolution are better at reasoning than those who do not.
- Even after instruction most students retain their original nonscientific conceptions.

Lawson, A. E. & Worsnop, W. A. (1992). Learning about evolution and rejecting A belief in special creation: effects of reflective reasoning skill, prior knowledge, prior belief and religious commitment. *Journal of Research in Science Teaching*, 29,143-166.

# Lawson & Weser

- Lawson & Weser (1990) similar conclusions
- Combined the study of creationism, orthogenesis, the soul, nonreductionism, vitalism, teleology and nonemergentism all into a study about nonscientific beliefs
- Creationism belief was not effected by the teaching of an evolutionary biology class.
- The course did not significantly increase the student belief in evolution even though it was taught from an evolutionary perspective.

# Lawson & Weser

“Finding support for the hypothesis that reasoning skills facilitate movement away from scientific misconceptions was found, but such movement appears to be difficult to make particularly in areas such as special creation/evolution, where emotional commitments run deep. Also, it appears that beliefs can be changed for other than rational reasons” (p. 605).

# Part V: Results

- LU study: found that students did shift significantly in beliefs regarding creationism/evolutionism when the course is taught from a creationist perspective.
- The shift was toward a creationist view and away from an evolutionist view
- Found that the students did not shift on the Lawon-Worsnop items in either direction.
- Students shifted away from an evolutionary view on MATE items toward a creationist view.

# The MATE

- Much better construction of items
- In many ways a mirror image of the CWS
- The evolutionary view is a real view; it is just not based in truth.
- The evolutionary view, like the creationist can be measured; it just needs to be done using correct methodology.

# Preliminary Results

- 10 items from the Lawson study were used. Only 2 showed a significant shift. In both cases, the shift was toward a stronger creation worldview. However, one item (#38) is ambiguous.
- Importantly, on four of the items, the students answered exactly opposite of what Lawson expected for creationists.
- Four Items were not representative of a creationist position and should not have been used in this way. We demonstrate that these are poor questions because the creationist students did not answer the way Lawson predicted.

# MATE items

- The MATE items shifted in the manner expected.
- The MATE items for the creationist students shifted away from an evolutionary view.
- Thus the MATE is a better instrument in terms of validity than the Lawson instrument.

# Part VII: Conclusions

- There is ample evidence showing belief shifts by students toward a creationist view and away from an evolutionary one. On the other hand a shift toward an evolutionary view is not apparent, nor documented in the current literature.
- We must resist the evolutionary attempts to indoctrinate our young people's mind and cause a change in their belief systems and attitudes toward the truth of creationism.
- We must support higher education at the undergraduate through doctoral levels that is creationist based.

# Conclusions

- It is noteworthy that other researchers have used a portion or all of the flawed Lawson instrument (Matthews, 2001; Sinclair & Pendarvis, 1997; Lawson & Weser, 1990, Verhey, 2005).
- Also, other researchers cite and or quote from Lawson & Worsnop (1992) without a single mention of these flaws (Matthews, 2001; Brazelton, et. al., 1999; Sinclair & Pendarvis, 1998; Sinclair & Pendarvis, 1997).
- It is also clear that problem is not just with the Lawson survey. McKeachie, Lin & Strayer (2002) are taken to task by Smith (2002) for poor item construction.

# Conclusions

- Instruments can be constructed to measure a worldview even if it is based on lies.
- Statistics can detect differences that researchers explain based on worldview. Often these differences point to the truth (although it is not detected by the researcher).
- Lack of understanding of the researcher (looking at data from the wrong worldview) can lead to wrong conclusions about the findings.
- It is important for the Christian to discern the worldview of others in relationship to research in the realm of science education.

# Conclusions

- There are some who are not creationist who are trying to do honest research.
- There are some who are not creationist who are out to try and destroy the creationist perspective.
- There is much work to be done in the realm of science education, especially as it relates to the sorting out the issues of the two worldviews that are represented.

# Articles

- Deckard, S. (Ed.). (2004). *Worldview studies and Biblical creationism. The Institute for Worldview Studies: [www.vision.edu/Research/IWS/](http://www.vision.edu/Research/IWS/)*
- Deckard, S. W., Berndt, C., Filakouridis, M., Iverson, T., & Dewitt, D. (2004). [College students' attitudes toward creation and evolution compared to their worldview.](#) *Worldview Studies and Biblical Creationism*. Ramona, CA: Vision International University, Retrieved August 4, 2005, from Vision International University Web site: <http://www.vision.edu/iws/>
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# More Articles

- Deckard, S. W. (1998). *Creationist Worldview Test (Version CWT-01)*. Nehemiah Institute, Lexington, KY.
- Deckard, S. & Sobko Gregory, (1998). Toward the development of an instrument for measuring a Christian creationist worldview. *Proceedings of the Fourth International Conference on Creationism*.
- Deckard, S. (1997). *PEERS Results*. Nehemiah Institute, Lexington, KY.
- Deckard, S. (1997). The capabilities of modern science in the formation of a modern worldview, *CRSQ*, 33:257-261.
- Deckard, S. (1986). A theoretical analysis of three science textbooks. University of Sarasota, Sarasota, FL.
- Henderson, T., Deckard, S., & DeWitt, D. (2003). Impact of a young-Earth creationist apologetics course on student creation worldview. *Technical Journal* 17:1

# Impact Articles

- Deckard, S., & Smithwick, D., (2002, May). High school students' attitudes towards creation and evolution compared to their worldview. *Impact Article* 347:i-iv.
- Deckard, S. (1998, December). A call to arms for conservative Christian science educators, *Impact Article* 306:i-iv.
- Overman, R.L. & Deckard, S. (1997, October). Origins beliefs among American science teachers (revised). *Impact article* 292:i-vi.
- Deckard, S. (1996, August). Biology textbooks worldview development and the creation/evolution controversy, *Impact Article*, 278:i-iv.
- Deckard, S., Barnett, J. & Overman, R., (1996, November). Implementing, a creationist based field trip, *Impact Article* 281:i-iv.

# Presentation

- Deckard, S., (9/15/2005). Developing a Creator-based Worldview. Workshop to be Presented to the Liberty University Faculty.
- Deckard, S. & DeWitt, D. (2004, October 15-16). *Effects of a history of life course on student views of science*. Seminar Presented at the AETS Mid-Atlantic Regional Conference, Roan Mountain, Tennessee.
- Deckard, S. (2004, October 23-24). Creation/Evolution and student attitudes toward science. Association Seminar Presented at the Education of Science Teachers (AETS), Gainesville, Fl.
- Deckard, S. (2/2-8/2003). Developing a Creator-Centered Worldview for Christian Education. Vision International College & University Leadership Conference.