

## Value Orientation Inventory: Development, application, and contributions

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### Abstract:

This paper provides an overview of the long and vigorous efforts made in the development, applications, and contributions of the Value Orientation Inventory (VOI) by Dr. Catherine D. Ennis, her students, and her colleagues. After a brief review of the development, validation, and cross-validation of the VOI and corresponding applications, the authors describe the contributions the VOI made in pedagogy research and the impact of teachers' value orientations on their teaching behaviors. They also discuss how a measurement tool should be developed and present Ennis's work as a model of how a research line should be established. Finally, they reflect on the limitations in measurement tool development in kinesiology and outline future directions for VOI revision and application.

**Keywords:** evaluation | measurement | physical education | research line | scholarship

### Article:

One of the most important legacies and contributions that Catherine D. Ennis made is her line of research on physical education teachers' value orientations. This specific research line and associated scholarship stemmed from developing the well-known Value Orientation Inventory (VOI; Chen, Ennis, & Lofus, 1997). In this paper we first focus on the development of the inventory, which included validation and cross-validation processes, applications, and contributions of the VOI. Then, we discuss in depth the VOI's contributions and implications from the measurement perspective. Finally, we describe and outline future directions of the VOI.

### Development of the VOI

#### *The Early Development of the VOI*

The original VOI, or VOI-1, was published in 1988 (Ennis & Hooper, 1988). While it was a rather short paper (less than 4 printed pages), it covered all key elements and steps to develop a scientific measure. First, a theoretical foundation was clearly described: "Educational values typically classified into five orientations: *disciplinary mastery, learning process, social*

*reconstruction, self-actualization and ecological validity*” (p. 277). Second, a 90-item measurement inventory was constructed including defining the distinct constructs, conducting the content analysis to determine the primary components of each orientation, collecting content validity evidence by sending the domain definitions to curriculum specialists for review, revising the definitions based on the feedback of the specialists, and writing items for 18 subcategories (5 items per subcategory, 90 items). Third, representations of the items were rated by 42 curriculum scholars using a 5-point Likert scale (5 = *strongly represents* to 1 = *poorly represents*). Fourth, the collected ratings were analyzed to determine the validity (with a focus on the item rating means) and reliability evidence (with a focus on internal consistency by computing Cronbach’s alpha [Cronbach, 1951]). Finally, efforts were made to develop a short 70-item version of the inventory and to confirm its validity and reliability.

### *First Revision of the VOI*

After the VOI-1 was used in subsequent studies (e.g., Ennis, Chen, & Ross, 1992; Ennis, Ross, & Chen, 1992; Ennis & Zhu, 1991), several limitations, primarily with the social reconstruction orientation, were recognized. Inconsistencies were found between the data and the theory. A major effort was then made to modify the VOI-1 to align the theoretical foundation of the value orientation within the setting of physical education. In this effort, Ennis and her colleagues completely revised the VOI-1 and developed a new version of the inventory, the VOI-2. Using the same rigorous procedures, Ennis first conducted a comprehensive literature search in school-based physical education literature. Second, based on the findings of the literature search, she redefined, renamed, and revised the domain specifications for each value orientation to tighten the direct interpretation of the theory with physical education. Specifically, the orientations of disciplinary mastery, learning process, and self-actualization in VOI-1 were redefined, ecological validity was relabeled ecological integration and redefined, and a new social domain was added to include a new subdomain labeled social responsibility that included items from the social reconstruction subdomain from VOI-1. The social responsibility domain was defined as follows: “Students learn social rules and norms for personal conduct that lead to appropriate social interactions of cooperation, teamwork, group participation, and respect for others” (Ennis & Chen, 1993). Third, 115 items were then developed for the VOI-2 with the standardized item stems “I teach,” “I encourage,” “I plan,” and so forth to reflect teachers’ conceptualizations of the teaching–learning behavior/action. Of the 115 items, 3 (2.6%) were from the VOI-1 without change, 37 (32.2%) were also from VOI-1 but with minor wording changes, and, finally, 75 (65.2%) were newly written. In addition, for validation purposes, 35 items were written as foils or confederate items and placed randomly as a test of item design and the rating processes.

After the items were developed, they were sent to 298 individuals including university pedagogists ( $n = 140$ , 63% of whom were involved in the development of VOI-1) and physical education teachers ( $n = 158$ ; 46 taught in elementary, 55 in middle, and 57 in high school) to evaluate each item’s content relevance and representation using a 5-point scale (5 = *very consistent with the domain sentence* to 1 = *not consistent*). Finally, the collected data were analyzed, and items with means  $>4.0$  were considered acceptable. In addition, chi-square statistics were employed to identify response differences by groups from different academic backgrounds (e.g., university vs. elementary vs. secondary schools). As a result, a new VOI, the

VOI-2, with a total of 90 items was developed with a new social responsibility suborientation as part of the inventory (Ennis & Chen, 1993).

### *Further Revision and Shortening of the VOI*

Four years after the publication of the VOI-2 and after many studies, Ennis and her colleagues analyzed the feedback from users across a variety of perspectives in the physical education community, including researchers, teachers, curriculum specialists, and supervisors. They found one salient suggestion, to make the inventory shorter than 90 items. The feedback from the field made it clear that a shorter version could better preserve reliability of data, considering the busy schedule of physical educators and the possible impact on reliability of fatigue in responding to 90 items. Ennis and her team made another effort to refine the original VOI (Chen, Ennis, & Loftus, 1997), with two focuses: to collect validity evidence based on the relation to school-based teacher value profiles and to shorten the test by eliminating the low-rated items. Two data sets were employed for the study. One consisted of 491 profiles collected in the earlier studies and another of 277 profiles collected in seven U.S. states and two other English-speaking countries. The validation included three stages. The first and second stages used the first data set to determine the weak representation statements (items) to be eliminated and to generate a new VOI-Short Form (SF) version. In the third stage, the same procedure was repeated using the second data set. Statistics such as Goodman and Kruskal's gamma (Goodman & Kruskal, 1954) and Cohen's kappa (Cohen, 1960) coefficients were employed for the data analysis. As a result of the study, the VOI-SF, with a total of 50 items in 10 sets of forced-choice scales, was developed.

### **Cross-Validation of the VOI**

During the development of the VOI, efforts were also made to cross-validate the scores from the inventory, that is, to test whether the same construct could be retained when it was applied to different cultures (Chen, Liu, & Ennis, 1997) and settings (Ennis & Chen, 1995). In Chen, Liu, and Ennis's study, the VOI-2 was administered to 495 physical education teachers in six American school districts and 359 physical education teachers in four Chinese school districts. The collected data were analyzed using chi-square statistics and a nested multivariate analysis of variance (MANOVA) model to identify differences between cultures in high value orientations (defined as 0.6 *SD* above the mean, Ennis & Zhu, 1991) and to cross compare universality and uniqueness of the value orientations in both cultures. It was found that both American and Chinese teachers valued disciplinary mastery and self-actualization value orientations, but the Chinese teachers highly preferred learning process and ecological integration values, while American teachers valued social responsibility orientation more.

In Ennis and Chen's 1995 study, the VOI-2 was administered to physical education teachers from three rural ( $n = 186$ ) and three urban ( $n = 295$ ) districts. The collected data were also analyzed using a nested MANOVA model to determine the impact of school location, teaching level, years of teaching experience, and gender. The results indicate that teachers appeared to shape their curriculum to reflect the opportunities and constraints in their school settings, with teachers in urban settings placing a higher priority on self-actualization and social responsibility

than their rural counterparts, who placed a higher priority on the disciplinary mastery and learning process orientations.

### **Applications of the VOI**

As the VOI was being developed, research studies were conducted using different versions of it. As an example, using the VOI-1, Ennis and Zhu (1991) and Ennis, Chen, and Ross (1992) found that physical educators have strong value priorities and can identify curricular goals consistent with their beliefs. Follow-up studies by Ennis, Ross, and Chen (1992) found that teachers' goals within each value orientation produced specific examples of curricular decisions, problematic curricular issues, instructional tasks, and evaluative procedures. Chen and Ennis's 1996 study is another example in which the relationship of teachers' curriculum goals and physical education content was examined in light of their individual value orientations using the VOI-2. It was found that clarifying teachers' value orientations is an appropriate initial step in curriculum innovation and change. Similarly, Chen, Zhang, Wells, Schweighardt, and Ennis (2017) examined the impact of value orientation incongruence between teachers and an externally designed curriculum on student learning using the VOI-SF. They found that a well-designed physical education curriculum may minimize the impact of teachers' diverse value orientations on curriculum implementation and student learning. Curtner-Smith, Baxter, and May (2018) present much greater detail in this issue of *Kinesiology Review*.

### **Contributions of the VOI**

In addition to the cited studies conducted by the Ennis research group, the VOI-2 and VOI-SF have been used in many studies. The topics of these studies include a focus on curriculum development, teacher effectiveness, and student learning. We view the contributions of VOI from three aspects: a pedagogy perspective, a measurement perspective, and exemplary scholarship development.

#### *Pedagogy Perspective*

Teacher value orientations are a powerful influence on curriculum and instruction decisions (Ennis, 1992). Since the applications of the VOI-1, research in physical education (Ennis & Chen, 1993, 1995; Ennis, Chen, & Ross, 1992; Ennis & Zhu, 1991) has revealed and confirmed five fundamental value orientations: disciplinary mastery, learning process, self-actualization, self/social responsibility, and ecological integration. Each value orientation serves as a philosophical foundation or a belief system guiding physical educators' curricular choices, instructional decisions, and teaching behaviors in physical education instructional practice.

As an important concept, teacher value orientations have long been accepted as a construct influencing curriculum choice and teaching behavior. Physical education researchers have been using the VOI as a premium measurement tool to determine teachers' value orientations and curriculum priorities. Extensive research has been conducted around the world in English-speaking countries with the original inventory (e.g. Gillespie, 2011, Australia). The VOI has been translated into different languages for studies in non-English-speaking countries such as French-speaking Canada (Banville, Desrosiers, & Genet-Volet, 2002), China (Chen, Liu, &

Ennis, 1997), Flanders (Behets & Vergauwen, 2004), and Taiwan (Liu & Silverman, 2006). As Curtner-Smith et al. (2018) summarized, the value orientation research findings have provided significant evidence that will continue to affect physical education. The findings and understanding from this line of research would never have been established without the development of VOI. Other works, in addition to those in this collection, can be found in Ennis (1992), Chen and Ennis (1996), and Chen et al. (2017).

### *Measurement Perspective*

The VOI is among the few exceptional measurement tools in kinesiology that have long-lasting applications and extensive use in meaningful ways. For example, the Test of Gross Motor Development (1st, 2nd, and 3rd eds., known as TGMD-1, -2, and -3; see <https://www.kines.umich.edu/tgmd3> for more information on the test) and FitnessGram®, a health-related youth fitness assessment tool, have more than 30 years of development history (see <http://www.cooperinstitute.org/fitnessgram> for more information on FitnessGram) and have extensive use in kinesiology and physical education. The VOI is not an instrument that has been used only once, a practice often seen in measurement tools in kinesiology. Many of these “one-shot” instruments are based on a questionable theoretical or methodological foundation, or both. These instruments may never be used a second time due to the many limitations stemming from problems associated with their development. The accumulation of such measurement tools will not help advance measurement practice in the field of kinesiology. The development and refinement of the VOI serves as an exemplary example of rigor and quality for future inventory development. Zhu (2012), therefore, called for the field of kinesiology to advocate a rigorous and systematic approach to developing new measurement inventories. He suggests the following major steps.

**A. Construct definition.** Any instrument must be established on a clearly defined construct. As one of the initial processes, the construct to be measured is clearly defined with clear statements. Operationally, a table of specification should be carefully developed, then evaluated by a panel of experts in the area to determine content validity. The expert group should consist of scholars, practitioners, and end users.

**B. Item and inventory construction.** The item-construction process needs to be carefully conducted and field-tested. The items or questions, including the response categories and scaling, should be developed according to the table of specification. After standardized administration instructions are developed, these items should be piloted using a small convenience sample to determine administration feasibility.

**C. Pilot testing.** After any modifications needed based on the information from the previous step, the inventory should be field-tested with a large sample ( $N > 200$ ) from the target population. Item analyses (including differential item functioning analysis), which have been omitted from many inventory-development processes, should be conducted to ensure that each item, including its response category and scaling, functions appropriately for the target population and its subgroups. Only after this step can factor-analysis methods be applied to test the internal structure of the inventory.

**D. Modification and repilot.** It is unlikely that an inventory can be established without significant modifications and retesting after Step B. Based on the information learned from Step C, both the items and the entire inventory should be modified carefully. The modified items and inventory should be validated again with the procedure outlined here, except when only minimal modification is needed.

**E. Validation.** The validity and reliability evidence can then be collected for the modified inventory with multiple samples, including at least one with a large sample size ( $N > 400$ ). Examples of validity evidence could include confirming internal structures based on the theoretical construct being measured, relationships with other existing well-established measures, expected response processes and patterns, confirmed group differences; examples for reliability evidence could include identifying errors from different facets (e.g., people, time, raters, or contexts), person stability, and score reliability. This step should include examining overall and local standard error of measurement or precision. In fact, multiple procedures should be conducted in this single step.

**F. Cross validation.** To ensure the generalizability of the measure, collected validity, and reliability evidence should be further confirmed by another sample from the same target population. If possible, split-sample cross validation should be avoided since the samples from the splitting process are often too similar to each other. If the inventory is extended to another subpopulation of different age, gender, or ethnicity or items have to be modified or deleted and new items have to be brought in, the cross validation may begin from Step D or E first. If the inventory is extended to other cultures and other languages, steps for cross validation in these contexts should be followed.

**G. Scaling and reporting.** One of the essential goals in developing an inventory is to measure and describe the construct being measured on a numerical scale on which scores with stable meaning can be compared even if multiple forms of the measure are created. The process of developing a scoring scale is called scaling (see Zhu, 2006, for more information). With a stable scale, developing a connection between a score and its real-life meaning becomes possible (e.g., to predict graduate school performance using GRE scores), which is much more important than the scaling itself. Thus, scaling is the foundation of interpreting the scores appropriately and generating appropriate reports. Developing reports with appropriately scaled scores should also be a part of this step.

**H. Multiple forms and item bank.** After a measurement scale is established, multiple forms of an inventory should be considered to meet the repeated assessment needs. Ideally, an item bank should eventually be constructed so that new items or questions can be consistently added. This will provide new forms with better efficiency and accuracy but still maintain the same scale, which can be developed to meet new subgroups' specific needs. Finally, with such a bank, constructing a computer adaptive testing-based measure also becomes possible.

**I. Revise, revise, and revise!** Finally, the psychometric quality of an inventory should be constantly monitored, revised, and updated. Only in this way can the quality of the inventory be maintained. Development and maintenance of a sound inventory is a lifelong commitment!

Looking back on the 30-year rich development and application history of the VOI, one can find that the development follows the preceding steps and loops extremely well. As a result, it sets an excellent example for future development of measurement and research tools in kinesiology.

### *An Exemplar of Scholarship Development*

The development of the VOI, along with Ennis's contribution in this area of research, sets an excellent example for programmatic scholarship. Ennis (1999) advised young scholars to establish a line of research with a strong theoretical framework. She used her research on the VOI as an example:

Establishing a line of research always begins with a plan of action that I call a research plan. For untenured faculty members, developing and implementing a research plan may seem more like racing through an orienteering course than creating a systematic plan to contribute new information to a knowledge base. Young scholars often feel as though they must dash madly from one orienteering flag (i.e., publication) to the next in their attempt to create products as quickly and efficiently as possible. Although products are important, I would like to encourage young scholars to slow their pace for just a moment and think about the development of their respective research plans as more like solving a puzzle than running a race. In the research puzzle, the central piece is the development of a theoretical framework to guide your research decisions. (p. 129)

In this 30-year effort of developing and applying the VOI, Ennis and her colleagues clearly followed this doctrine and made significant contributions to our understanding of the relationship between teacher value orientations and teaching behaviors. VOI research has extended the pedagogy scholarship and addressed many important research questions in physical education.

### **Future Direction for the VOI**

The 21st century has been full of exciting developments in educational and psychological measurement theories and methods, including the evolution of validity techniques, new and rich statistical methods for validation, score reliability and local precision methods, new testing theories, equating and item banking, computerized adaptive testing, test fairness and differential item functioning procedures, cognitively diagnostic assessment, and a technology revolution to make data collection easier, to just name a few (see Zhu, 2012 for more details on innovations and for consistent problems that plague kinesiology instrument development research). While attempts were made with the VOI research to be as stringent as possible and use modern measurement techniques such as item response theory to analyze VOI-2 data (Zhu, Ennis, & Chen, 1998), these new techniques provide other opportunities to improve the VOI.

Beginning in 2014, Ennis saw a need to further revise the VOI and reexamine its theoretical perspective. She anticipated that with the new directions for physical education (e.g., a health emphasis and physical literacy; Ennis, 2015) many items and theoretical domains would lose their relevance. She had worked with her colleagues to reexamine the entire value orientation theory and proposed and actually planned to begin, again, with a new round of revisions of the social responsibility/reconstruction orientation. Based on an extended literature review, she

envisioned that a new suborientation, social justice, would be integrated in the social-oriented domain. She planned to test the viability of this multidimensional construct as a construct of VOI theory. Items were written and a small set of data was collected before she stopped her work on this to focus on her health. She also planned a second phase of revisions, which would address all items so that they included emerging pedagogical practices such as the use of behavioral indicators of multiple and digital technologies in teaching physical education. We believe that these modifications will be carried out in the future to strengthen the VOI so that it can continue to be used for many years to come.

## Conclusion

The development and application of the VOI have contributed greatly to our understanding of the role of teachers' value orientations in their teaching practice. Many studies from this line of research have been regarded as seminal and are a must-read for pedagogical scholars. The long and vigorous effort to develop, validate, cross-validate, and revise the VOI has become an example of how a measurement tool should be developed. Meanwhile, the development of the VOI and the important contributions it has made provide exemplary examples of how a significant line of research and scholarship can be established.

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