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Introduction

By Joseph M. Scandura

This retrospective is based on a long history of basic and applied research on the teaching-learning process. It was motivated initially in communications with the TICL publisher, with whom I have worked for many of the last 50 plus years. This effort was reinforced by comments and suggestions, and most directly from colleagues, several of whom played a significant role in my earlier research.

We begin with my long history of basic research on teaching and learning process and the Structural Learning Theory that evolved therefrom. In retrospect, the SLT might have better been named "Theory of Structured Teaching and Learning"). This theory and associated research have played a major role in building our AuthorIT and TutorIT systems.

Let's begin with some initial observations. AuthorIT and TutorIT build directly on SLT and are designed to model human tutors. (See www.TutorITweb.com for the current status.) Unlike other contemporary adaptive learning systems, TutorIT tutorials are designed to interact with students as would an optimized tutor or teacher.

Other contemporary adaptive learning systems are eclectic in nature. Some build on assumed learning theories (e.g., Carnegie Learning, ALEKS) or rely on computation-based Big Data systems that make pedagogical decisions automatically (Knewton) based on increasingly large collections of data about student accomplishments and preferences.

AuthorIT and TutorIT build on decades of basic research and theory development in the SLT. Designed from inceptions as a theory of teaching and learning, SLT is fundamentally different from other "learning theories". There are two major differences in the way AuthorIT and TutorIT and any other authoring methodology and tutor delivery system work.

AuthorIT makes it possible to pinpoint what needs to be learned for success – with arbitrary degrees of precision and at all levels of expertise from neophyte to expert. TutorIT takes this information as input and makes ALL pedagogical decisions automatically. It interacts with each student as would an optimized tutor, automatically step by step, and decision by decision.

This approach makes it possible to pre-specify degree of mastery while completely eliminating the need to program pedagogical decision making. **The tutorials created and the technologies used to create them have two unique characteristics. The tutorials themselves BOTH interact with each student automatically AND guarantee student mastery on completion. Content experts use AuthorIT (or its easier to use but less powerful EZauthor variant) to specify what students are to learn. Given a domain of to-be-learned content, AuthorIT is used to pinpoint the knowledge to be learned for success.**

TutorIT takes such to-be-learned knowledge and a to-be-solved problem as input, TutorIT make ALL pedagogical decisions automatically. Development costs are cut by half or more. EZauthor cuts development costs even more – to a small fraction. Instead of working step by step decision by decision, however, EZauthor works with problems as a whole. It can guarantee mastery on completion but it cannot guarantee that every student will in fact finish.

Background: By way of background, my professional life has always been goal driven. School and athletics both came easily. During my early years, however, my main focus was on sports. Tipping the scales at 150 pounds (still close), however, my future in football was strictly limited – especially when Michigan dropped their 150-pound Football team the summer before I arrived. I also competed in high school, college and Olympic style wrestling. I won the outstanding Senior Student Athlete Award at Michigan in 1953. This was followed in 1955 by winning the National AAU title in wrestling at 147.5 and being selected for the Outstanding Wrestler Award.

I closely missed a berth on the ’56 Olympic Team while I was a beginning math professor at SUNY Oswego, NY. Unlike the previous year when I won, however, the training facilities were poor and had to travel over 100 miles to have anyone to work out with.

This limitation aside, having taken a couple graduate courses at nearby Syracuse University, I decided to go on for a PhD in mathematics. As luck would have it, the wrestling coach and former national champion, Joe McDaniels, was taking a leave of absence. He had seen me win the nationals the year before and invited me to apply. Coaching a sport I loved while continuing my PhD in mathematics was too good to turn down. I coached wrestling at Syracuse University for seven years while working on my PhD in mathematics. I graduated in 1962 but continued coaching an extra year while beginning my research career. It was worth it as my team went an undefeated and untied in 1963, with the strongest team in the country.

Ultimately, I had to make a choice. While staying in touch, I exchanged athletic challenges for research. Early on, a fellow postdoc in experimental psychology commented that his professional goal was to "add a few grains of sand on the (academic) beach". I remember thinking at the time: If sprinkling sand was all I could do, I would rather spend my time sunning on the beach.

In this retrospective, I hope to convey some sense of my goals, opportunities, challenges, my successes and my failures over the years. Looking back, my research and professional life took place in two phases. Phase one focused on defining a field of basic research that did NOT exist at the time.

This work focused on finding answers to four basic questions:

1. *What does it mean to know something?* Initially, this work focused on mathematics but soon expanded to any structured content.
2. *How do people solve novel problems or acquire new knowledge?* Or, solve problems for which one has not been taught how?
3. *How can one (e.g., a teacher, or automated system) determine what mathematics a student does and does not know at any given point in time?*
4. How can this all be put together in a theory of teaching and learning, a theory that is at once comprehensive, rigorous, precise and operationally defined?

What follows are my attempts to achieve these lofty goals.

I didn't want to just improve mathematics and science education, my initial areas of training. I wanted to understand the process of teaching and learning at a deeper level. During my high school and college years, I had developed a deep appreciation for both formal systems in mathematics and classical theories in physics. My goal and hope was to develop analogous theory in teaching and learning – to identify fundamental assumptions, and to derive provable implications therefrom.

Classical physics covers physical phenomena that can be observed more or less directly (e.g., albeit often requiring a telescope). Building on the work of scientists like Copernicus, Galileo and Kepler, Newton pulled it all together in a grand theory that was at once rigorous, comprehensive, explanatory and predictive. Ignoring gaps later exposed by the likes of Maxwell and Einstein, together with Heisenberg's Uncertainty Principle, Newtonian physics offers a rigorous, comprehensive and beautiful framework that integrates a broad range of physical phenomena. It offers a rigorous, comprehensive and testable theoretical framework – most importantly, a deterministic theoretical framework that has and continues after centuries of use to still serve a useful purpose.

In the 1960s, and most would say continuing today, there has been nothing comparable in either education or psychology. Nonetheless, my goal was and has been to create, test and refine the equivalent of Newtonian theory in behavioral science. I wanted to understand, and be able to predict, even control the behavior of students in well-defined, well controlled situations.

I felt, first intuitively, and later more formally, a deterministic theory of teaching and learning, should and moreover could be placed on a similarly rigorous foundation. Students differ greatly in their understanding of mathematics (or any structured/measurable subject matter). Given a definable domain of knowledge, I wanted a way to specify what needs to be learned for success in that domain. Furthermore, **I wanted to understand and effectively be able to identify and control:**

a) what students need to know for success,
b) a way to determine what any given student knows at any given point in time and
c) what needs to be learned for success.

Overall, my goal has been to find answers that worked for both well-defined knowledge and new knowledge that can only be inferred indirectly from what is already known.

Perhaps the biggest challenge in answering these questions is determining what any given student knows that is relevant at each point in time. Students frequently differ fundamentally in what they bring to any given learning situation. A critical prerequisite for answering these questions is knowing what a student knows that is relevant on entry.

The problem is that individuals enter into any given learning situation with varying degrees of relevant knowledge. To facilitate understanding, I created artificial math-like content having both a definable syntax and a corresponding semantics. The goal was to help ensure that all students entered at the same point.

<u>Part I</u>: Looking back, my research has taken place in two major phases. In large measure, this was a result of both progress and opportunity. The history that follows draws directly on my publications and the software systems we have built over the years. This early work took place in a world where the very notion of deterministic theory in behavioral science appeared untenable.

I first proposed this possibility in 1970 at one of the Structural Learning Conferences I organized for several years at Penn. This was followed by publication in 1971 of *"Deterministic Theorizing in Structural Learning:*

54. Scandura, J.M. What is a rule? Journal of Educational Psychology, 1972, 63, 179–185.

https://tinyurl.com/54scandura

Rule-governed behavior is defined as a function involving classes of overt stimuli and responses in which each class of overt stimuli is paired with a unique class of overt responses. This definition provides a basis for analyzing many kinds of complex behavior; conceptual and association-governed behavior are shown to be special cases. Rule-governed behavior is accounted for in terms of a rule construct, defined as a triple (D, O, B) where D refers to the set of n-tuples of stimulus properties which determine the responses, and O, to the operator which maps the properties in D onto the internal responses in R. It is argued that the distinction between rules and rule-governed behavior is important and should be kept in mind in formulating research.

***Three Levels of Theorizing"* (#55 in my list of publications). Some seemed fascinated with the idea, and the paper eventually became one of ISI's most widely cited papers. Most, however, trained in standard experimental methods found it hard to conceive of predicting the behavior of individuals in specific situations.**

To counter the near universal belief among psychologists and educational theorists that behavior is inherently stochastic, I took great pleasure posing the following in talks on the subject. ***Relaying a hypothetical event in physics, I challenged listeners to imagine Galileo at the Leaning Tower of Pisa. Instead of dropping a large stone and a small stone, I asked listeners to imagine what might have happened had Galileo instead (as I did when people were still allowed to climb the tower) dropped a small stone and a feather. How differently physics might have developed!***

Instead of focusing on what happens in a vacuum under idealized conditions, one can only imagine instead "an alternative science of droppings" – calculating and documenting the average rates of fall of various kinds of objects. **Read on: Our research demonstrates that deterministic results are not only feasible in research on human behavior, but in many cases preferable.**

The first issue in this volume focuses on my early research and theory development. My goal of this research was to help shape development of the field by devising a rigorous, deterministic theory reminiscent of classical physics – a theory that would make it possible to understand, predict and, under appropriate conditions, even control the learning process.

It quickly became clear that achieving this goal would require far more than mathematics itself, or the so-called "action research" characteristic of the "new math" of the early-mid 1960s. It also would require fundamental revision of what mathematical, experimental and developmental psychologists had to offer.

Among the investigators and the works that most influenced my thinking during this period (with apologies for inevitable omissions) included: a) Polya's "Mathematical Discovery", b) Z. P. Dienes' work helping young children learn mathematics, c) mathematical foundations (e.g., Gödel's incompleteness theorem), d) Bruner, Goodnow & Austin's "A Study of Thinking", e) research on concept and rule learning (e.g., Bourne, Kersh, Wittrock), f) the rigorous methods used in experimental psychology (Atkinson, Melton, Postman et al), f) Suppes, Estes and Atkinson's and colleagues work in mathematical psychology, g) Gagne's conditions of learning and to a lesser extent h) Piaget's stages of cognitive development and i) early work in Artificial Intelligence.

Dissatisfied with the informal, incomplete and/or statistical nature in this work, I sought to emulate goals adopted by renaissance physicists. By

analogy, my goal was to understand, predict and even control human learning in specific situations – under idealized conditions. I sought to develop and test a simple, cohesive, yet deterministic and testable theory making it possible to explain, predict and even control the behavior of individual students in specific problem situations.

A natural successor to this work focused on automation. Finding both hardware and subsequently then current software technologies inadequate for full application of the SLT, I first turned my attention to software engineering – building needed technical foundations. **Initially, this required extending, applying and refining the process of Structural Analysis (SA) in software engineering.** This work in turn enabled us to formalize key essentials of the SLT and to implement those essentials in automating the tutoring process.

Our initial goal in this area was to create software that is correct by design. Given any content domain, this work brought home the critical need to systematize our previously informal processes of Structural Analysis (SA). Initially used to identify what needs to be learned for success in any given content domain, we found that SA also offered a rigorous foundation for designing and implementing complex software systems. Instead of focusing on coding, we focused on working from the top-down.

As we shall see, solutions to two key problems in the initial formulation of the SLT were a welcomed side effect of applying Structural Analysis in software engineering. This work led to highly efficient automated technologies for both creating and delivering systems that model human tutoring processes. There remains more to do, but many essentials have been realized in our AuthorIT authoring and TutorIT delivery systems. These systems are now fully operational. They offer unprecedented control of pedagogical decision making while dramatically reducing the cost and effort of development.

But let's not get ahead of ourselves. Let's begin by focusing on the foundational theory and research on which subsequent research builds.

THEORETICAL AND EMPIRICAL RESEARCH DEVELOPING AND PROVING THE STRUCTURAL LEARNING THEORY

Given my background in mathematics and education, my initial research took place in the context of the so-called "New Math" of the 1960s. A common theme in this work was that students learned best if they discovered mathematics on their own. In retrospect, this was not a surprising hypothesis because inventors of the so-called "new math" were almost uniformly mathematicians – for whom mathematics came easily. Unfortunately, converting students into little mathematicians went only so far.

The goal of my dissertation research was to understand the teaching-learning process at a deeper level. If mathematical discovery is truly better, why is it better? After several years of intensive work, I discovered that **what** a student knows **when** information is given is far more important than **how** it is learned – whether by **discovery** or via **exposition**. Moreover, the ideas involved appeared to transcend mathematics per se.

My work took place in a context largely devoid of serious research. The new breed of math educators called what they did "action research". A good deal of my professional energies during that period went into identifying the need for and motivating serious foundational research in math education. In parallel, I got deeply involved in experimental and mathematical psychology. Although disagreeing with the dominant focus of this research, the **discipline** in S-R research in those days was far more advanced (and replicable) in psychology than in educational psychology.

As most psychologists know, Gagne proposed various categories of learning, beginning in his influential book "Conditions of Learning". Each category required a different way to learn. S-R learning, chains of S-R associations (verbal or otherwise), concept learning, rule learning and problem solving. In short, S-R associations were considered basic. The others essentially were represented as various combinations of S-R associations.

I helped move the focus toward rule learning. I found that knowledge could better and more cohesively be represented in terms of rules. Associations and concepts, for example, are just special cases of rules. Rules initially consisted of D, O, R triples, Operations (O) acting on a Domain of tasks (D) and generating solutions/Ranges (R). Problem solving involved (higher order) rules operating on other rules and generating new (solution) rules. Wording aside, many if not most today would agree with this change of focus.

In short, rules rather than S-R associations became the basic unit of behavior. Concepts and associations are special cases. Problem solving is required when no previously mastered knowledge is sufficient. Problem solving in my view requires higher order rules operating on and generating new rules as needed.

During this period, with help from a growing contingent of graduate students, I published a monograph and several books (M1, B1-B8) along with a large number of studies in experimental, educational and developmental psychology. In appreciation for their help, I particularly would like to single out Merlyn Behr, William Roughead, Jay Norman Wells, George Lowerre, John H. Durnin, Don Voorhies, Walter Ehrenpreis, Judy Anderson, Joan Barksdale, Bob McGee, Francine

Endicott and Jaqueline Veneski and Wally Wulfeck (forgive me for those overlooked). John and Wally contributed over a long period of time to some of our most definitive basic research and deserve special credit.

Other colleagues contributed directly relevant research in mathematical psychology (e.g., Suppes, Greeno), mathematics and science education (Z.P. Dienes, Paul Rosenbloom, Jack Nelson, David Johnson) and educational psychology. Singled out for her help over the longest period of time in so many ways, academic and otherwise, is my wife of over 60 years (Alice B. Scandura). After bearing and raising our four children, she returned to graduate school to earn her PhD at Penn. Her work applying SLT principles in Piagetian research remains definitive to this day (B8).

An increasingly common theme in this research is that the more precisely one can identify what needs to be learned for success, the less necessary the associated empirical research became. The focus of my early research was on mathematics education. It soon broadened to include parallel research in experimental, educational and developmental psychology and artificial intelligence.

This work ultimately led to the first iteration of the Structural Learning Theory (SLT) and a broad range of basic research supporting the theory. The focus of my research later shifted to software engineering and ultimately to the AuthorIT authoring and TutorIT delivery systems that dominate current work and enable us to model human tutoring.

This work led to the development of a series of TutorIT tutorials and authoring systems for creating such tutorials. These tutorials are unique in the sense that they guarantee predetermined levels of mastery on completion. The to-be-introduced authoring systems ensure that TutorIT gets the information it needs to ensure mastery.

A good deal of my early empirical research, especially that addressing foundational issues, is based on research conducted with the help of my former students (and colleagues) which is gratefully acknowledged. I hope it gives some sense of the broad range of challenges we faced, the research we conducted, along with our accomplishments.

The initial goal of this research was to understand the teaching-learning process with focus on mathematical (and other) problem solving. In parallel, considerable effort was made to motivate broader interest in research within the math and science education communities. I also worked hard to extract relevant information from basic research in experimental psychology and artificial intelligence. All played a role in the creation, testing and refinement of the Structural Learning Theory (SLT).

I hope that following the printed record offers an accurate sense of the challenges faced during my career, along with my solutions, other accomplishments and disappointments. The following Chapters generally parallel my publications. The information in any given chapter ranges from short summaries of one or more articles on a topic to full articles that are judged of particular relevance.

What follows in each chapter are long and shorter summaries of work reported in my available publications in the immediate time frame along with contemporary commentary on these publications. (*Most but not all of these publications are available from the links in this document.*) In addition to availability, permissions and most important relevance, publications are printed in the following chapters in full, often with contemporary commentary. Others are simply listed with little or no commentary.

Each publication is numbered according to date. However, they also are grouped locally by topic (i.e., "article" in TICL). Each publication listed serves as a link to the referenced publication.

Although these publications are listed chronologically by number, they are locally arranged to reflect topics as in book chapters. Each publication in these chapters begins with an electronic link to an available publication. These links are followed either by the publication or by a summary with consistent with its availability and/or importance. Book summaries come after articles and generally are much shorter than article summaries. The nature and depth of these comments depends primarily on what was most significant and/or important to me. In many cases, what is included is constrained by publication policies of some organizations sponsoring the publication.

1. Scandura, JM. A short history of my academic and athletic life starting with Bay Shore high school.

At our 75th reunion, Bob Margolin (a writer and an old friend I went to school with at both Bay Shore High School and the University of Michigan), and the event organizer, Kathleen Allen Hanley (Kate), BSHS '62, asked if I would write as summary of my work career. Here's what I wrote:

Hi Bob and Kathleen,

Alice reminded me that each of you had asked for a summary of my work over the years. As you know and to over simplify, I had two rather distinct careers, one in athletics and one in academics. Both played a major ongoing role in my life. Math and science came easily in high school and I graduated first in my class. I benefitted significantly from Coach Cliff

LaPlatney's teaching in both class and coaching in football – he taught both with the same discipline. He demanded the same discipline in Physics, Chemistry and Earth Science classes that he did in coaching. Chuck Geddes, my JV football coach, taught high school mathematics. In short, both played a major role in my future academic focus on math and the sciences. My wrestling coach, Cliff Clark, emphasized softer academics, and wanted me to go to Yale or Columbia. Their teams were second rate, however, so he ultimately agreed to my choice of Michigan.

Given my strong but only 150 pound football frame in football, I had to settle for second in the outstanding athlete award at my school to my buddie Gene Vesey. I was Suffolk County Champion in wrestling. However, I came in second to Bob Bury from Mepham in the 1949 Long Island championship tournament. I went on to wrestle for the University of Michigan. Unfortunately, Michigan dropped their 150 pound football team in the summer but in retrospect this was probably best (for me). In wrestling, we were Big 10 champions in my senior year.

After school, while teaching mathematics at White Plains, Bay Shore and SUNY Oswego, I finished my bachelor and master degrees at Michigan. I did have the satisfaction of beating Bob Bury years later in the 1955 National AAU, where I was voted Outstanding Wrestler in the tournament. The trophy still dominates our living room.

At Bay Shore, I helped my old coach Cliff Clark with Bay Shore's championship wrestling team. I coached Syracuse's undefeated wrestling team in 1962-3 at Syracuse University while working on a PhD in mathematics, statistics and psychology.

I continued coaching wrestling at Syracuse for a year after receiving my PhD. We won the EIWA championship in 1963 and ranked first as the best team in the nation. The next year, I reluctantly left competitive wrestling to focus on academics. (Later, I coached my son on the side. He won the National Wrestling Prep School Championship at Lawrenceville, and is now a professor of medicine at Weill-Cornell in New York City).

After Syracuse, I served as an assistant professor in the mathematics and education departments at SUNY Buffalo for a year. Then, I was recruited to serve at Florida State as an Assistant Professor in Mathematics Education Research. After two years, I was invited to start doctoral programs in Mathematics Education Research and Structural Learning at the University of Pennsylvania. In parallel, with my wife Alice and oldest daughter Jeanne in hand and later Jani, Joe (IV) and Jules, I took a series *of summer appointments at Indiana University, University of Michigan and Stanford along with Kiel and Koblenz Universities in Germany. On the side, we bought one of the original Apple laptop computers, and created the first SAT prep tutorial, along with over two hundred software tutorials in mathematics and science.*

Fast forward, the publisher of the TICL journal (i.e., Technology, Instruction, Cognition & Learning) recently asked me to prepare a summary of my work over the years for publication in a special issue. This is part of the first article in the series. I hope to have it in the publisher's hands in the next few weeks.

Following is a link to access any of my eight books and 210 publications: https://tutoritweb.com/WhitePapers.aspx?type=Publications

These publications will be distributed by Old City Publishers as four issues in its 25 year Technology, Instruction, Cognition & Learning series.

You also might find our websites of interest:

https://tutoritweb.com *provides access to our Tutoring systems.*

https://tutoritweb.com/home.aspx *provides access to our Authoring systems.*

These websites are not yet professionally hosted (we are doing it ourselves). Our goal is to find a publisher capable of marketing and maintaining these systems.

Toward this end, I have been fortunate to have the help of several students at Penn. Sophia Xu and Brianna Kwa are helping to assemble our publications. Wei Zhang helped refine our largely functioning and patented Authoring and Tutoring technologies, but more needs to be done. We currently are seeking a software publisher toward this end.

Last but far from least, it was great after so many years to see Bob Margolin and my other fellow Bay Shore graduates again, especially Jim Merkel who organized the gathering, and meeting Kathleen at Bay Shore, Long Island's high school reunion. Alice said that you had each asked for this information. Please let me know if you receive this and/or have any questions.

All the best,

Joe

Following are more specific comments about a few of the outstanding wrestlers I coached at Syracuse University:

Les Austin was an EIWA Champion, second in the NCAA tournament, who also went on to receive his MD degree at Syracuse University.

Upper weight Bill White and lower weight Ed Carlin were other outstanding wrestlers I coached. I recommended Ed for the position and periodically advised him after he was selected to continue coaching after I left for academia.

Art Baker was the fullback on Syracuse's undefeated National Champion football team under Coach Ben Schwartzwalder. The same year (1959) he also was Syracuse University's first National Wrestling Champion. He wrestled under Coach Joe Scandura and was undefeated. Ranked number 2 in the nation to Cornell's number 1 seed Tim Wooden, Baker beat Wooden, also undefeated, in the NCAA semi-finals. Baker successfully used a strategy Coach Scandura suggested just prior to his match. In the process, he became the first African-American to win an NCAA wrestling title.

Coach Scandura's second NCAA Champion was Jim Nance. Jim went on to star as a fullback for the Boston (now New England) Patriots from the mid 1960s into the mid 1970s.

In an article for Amateur Wrestling News, wrestling historian Jay Hammond describes Nance as "a transforming figure in collegiate wrestling". He brought a level of speed, strength, and athleticism to the heavyweight class that had rarely been seen before on the mats. He created the mold for the many great, big men that were to come. In the same article, legendary Lehigh coach Gerry Leeman proclaimed, "Jim Nance was the best wrestler I saw at heavyweight."

Jim Nance was a two-time Pennsylvania state champ, winning the heavyweight title in 1960 and 1961 for his high school in the town of Indiana, Pennsylvania. Like fellow Pennsylvanian Art Baker before him, Nance headed to upstate New Work to go to Syracuse University to play football and wrestle. As a sophomore, he won the EIWA heavyweight title in 1963. Then, a couple weeks later, at the NCAAs at Kent State University in Ohio, Nance took the heavyweight title by defeating Larry Kristoff of Southern Illinois University-Carbondale in the finals, becoming the first African-American to win a college heavyweight championship. That same, year, Martin Luther King Jr. gave his stirring "I Have A Dream" speech to tens of thousands gathered on the Mall in Washington D.C.

The following season, Jim Nance won his second and third EIWA crowns and his second NCAA championship. In his second and third years, Nance claimed his second and third individual EIWA titles, following by his second NCAA title in his senior year, becoming the only Black wrestler to win two NCAA titles in any weight class. Sadly, after his NFL career, Nance suffered a series of strokes, and passed away in 1992 at the age of 42.

Syracuse's 1963 undefeated EIWA Championship Team was ranked number one in the nation, the first and only time in Syracuse's history. The 1963 team consisted of:

Terry Haise (123 pounds) who beat the former EIWA Champion but was hurt and forced to default in the tournament,

Sonny Greenhalgh (130) who tied the NCAA champion in the dual meet and went on to coach the premier New York Athletic Club's championship team, where the best contenders routinely prepared for the Olympics.

Jim Murrin (137) who tied the EIWA champion,

Dick Slutsky (147) who took second in the NCAAs to the defending champion and repeated the following year,

George Riedner (157) who lost in duals only to the NCAA champion,

Captain Gary Sirota (167), the only senior on the team who led the champion in our dual but regrettably missed his goal of becoming an EIWA Champion,

Lew Roberts (177) ranked first in the EIWA but who lost by making a mistake in the EIWA tournament,

Gerry Everling (191), undefeated in dual meets all season, had to default after being ahead of the eventual NCAA Champion from Oklahoma and

Jim Nance (Unlimited), Syracuse's undefeated a two-time NCAA Champion.