Intellectual Development Models for Undergraduate Education

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Intellectual development is the process of gaining and retaining new knowledge. This process is also known as “epistemological development”, which means ways of knowing. In this paper, I will cover four different models of intellectual development, conflicting views and recommendations for promoting intellectual development in the classroom. There are four models of intellectual development: Perry, Baxter-Magolda, King-Kitchener and Belenky.

Models of Intellectual Development

Perry’s Scheme of Intellectual Development
William Perry Jr, a educational psychologist and student counselor at Harvard in the 1950s and 1960s, developed his scheme by interviewing undergraduate students on an annual basis over a four year period. Perry’s Scheme of intellectual development has nine positions: basic duality, multiplicity pre-legitimate, multiplicity subordinate, multiplicity correlate, relativism, commitments foreseen, initial commitment, orientations in implications of commitment, and developing commitment. Basic duality views knowledge as a finite organized group of facts which forms the truth on a subject. Multiplicity pre-legitimate views knowledge as facts, principles or rules which can be proofed, although the one who can do the proof is an expert in the field. Multiplicity subordinate views knowledge as facts, principles or rules which can be proofed, although the one who can do the proof may be an instructor or faculty member that they know. Multiplicity correlate views knowledge as an individual or organization interpretation and one interpretation is just as good as another. Relativism views knowledge as always changing. Commitment foreseen views knowledge as the world’s view constructed from an individual’s experiences. Initial commitment views knowledge as the individual’s world view which is constructed from their experiences, incorporating ethical implications to a consistent philosophy. Orientation in implications of commitment views knowledge as a creative resolution between self and the environment, which requires both stability and flexibility. Developing commitment views knowledge as an evolution of awareness, where the individual breaks through to new perspectives and discards those that are no longer useful. Most universities do not get their students past relativism during their undergraduate experience. This theory has had wide acceptance. In 1987 Battaglini and Schenkat wrote about the "Perry Network Bibliography" which is updated semi-annually and has currently over 300 citations and is available through the ERIC database. [1],[4]

Baxter-Magolda’s Model
Baxter-Magolda’s Epistemological Reflection Model was developed in the 1980s at Miami University of Ohio. This model is directed from the student’s point of view focusing on the
learner’s processes. This model has four major categories: absolute, transitional, independent and contextual knowing; with a gender related discussion in the lower three levels. Each category is compared against five domains: nature of knowledge, role of learner, role of peers, role of instructor, and evaluation. See Figure 1 from Models of College Students’ Epistemological Development by Sharon Pugh. This is another model that has been generally accepted.

<table>
<thead>
<tr>
<th>Domains</th>
<th>Absolute Knowing</th>
<th>Transitional Knowing</th>
<th>Independent Knowing</th>
<th>Contextual Knowing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of knowledge</td>
<td>Is certain or absolute</td>
<td>Is partially certain and partially uncertain</td>
<td>Is uncertain -- everyone has own beliefs</td>
<td>Is contextual; judge on basis of evidence in context</td>
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<tr>
<td>Role of learner</td>
<td>Obtains knowledge from instructor</td>
<td>Understands knowledge</td>
<td>Thinks for self</td>
<td>Exchanges and compares perspectives</td>
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<td></td>
<td></td>
<td></td>
<td>Shares views with others</td>
<td>Thinks through problems</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Creates own perspective</td>
<td>Integrates and applies knowledge</td>
</tr>
<tr>
<td>Role of peers</td>
<td>Share Materials</td>
<td>Provide active exchanges</td>
<td>Share views</td>
<td>Enhance learning via quality contributions</td>
</tr>
<tr>
<td></td>
<td>Explain what they have learned to each other</td>
<td></td>
<td>Serve as a source of knowledge</td>
<td></td>
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<tr>
<td>Role of instructor</td>
<td>Communicates knowledge appropriately</td>
<td>Uses methods aimed at understanding</td>
<td>Promotes independent thinking</td>
<td>Promotes application of knowledge in context</td>
</tr>
<tr>
<td></td>
<td>Ensures that student understands knowledge</td>
<td>Employs methods that help apply knowledge</td>
<td>Promotes exchange of opinions</td>
<td>Promotes evaluative discussion of perspectives</td>
</tr>
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<tr>
<td>Evaluation</td>
<td>Provides vehicle to show instructor what was learned</td>
<td>Measures students’ understanding of the material</td>
<td>Rewards independent thinking</td>
<td>Accurately measures competence</td>
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</tbody>
</table>

Figure 1 Baxter-Magolda’s Epistemological Reflection Model from [7]

**King-Kitchener Model**
The King-Kitchener Model has seven stages which can be described in four major groups: early pre-reflective thinking, late pre-reflective thinking, quasi-reflective thinking and reflective thinking. Early pre-reflective thinking (stages 1-2) assumes that those in positions of authority have the truth and the responsibility to communicate it with their students’ responsibility to memorize and repeat. Late pre-reflective thinking (stage 3) assumes that some knowledge is certain and some is not, with authorities having the responsibility to communicate the certainties and the students making their own judgments on the uncertainties. Quasi-reflective thinking (stages 4-5) has the students accepting responsibility for their learning, but since most knowledge is uncertain, they believe that all conclusions are equally good. Reflective thinking (stages 6-7) has students accepting responsibility to make judgments despite uncertainty and ambiguity, and using all possible sources of evidence to come to the best solution. They are open to change if new evidence is presented. There have been over 1,700 participants of the Reflective Judgment Interview and a 10 year longitudinal study of three different cohorts with no clear discrepancy based on gender or ethnicity. The high school educated typically scored 3.2 on the RJI which shows late pre-reflective thinking. The average college senior typically scored 4 on the RJI. Moving up to 4 which shows quasi-reflective thinking. The average graduate student typically scored 4.76 which still only demonstrate quasi-reflective thinking. Stage 6 has only been consistently observed among advanced doctoral students.
Belenky et al.’s Model
In 1986, Mary Belenky and her colleagues developed the Belenky model to address gender issues not taken into account for by the Perry model. This was done by interviewing both college and non-college women. This summary is from references [3-4]. There are six ways of knowing in the Belenky model: silence, received knowing, subjective knowing, procedural knowing I, procedural knowing II, and constructed truth. The silence way of knowing acquiesces to authority without question or even an attempt to understand ascribing to subjected or passive woman. The received knowing women are open to what others have to offer, but do not see themselves as an equal and do not speak in their own voice. The subjective knowing women have a sense of self which overcomes outside authority and allows them to develop their own voice. The procedural knowing I women abandon subjective knowing, becomes skeptical and uses procedural means to evaluate any situation or make a decision. The procedural knowing II women retain the traits of subjective knowing, but develop procedural methods to access others’ knowledge and perspectives. The constructed knowing women integrate the received, subjective and procedural ways of knowing to construct knowledge.

Conflicting Views

There is a disagreement in the validity of the Perry Model due to the subjects being students attending Harvard in the 1950s, which makes most of those tested white males, with limited applicability to women or other diverse groups.[3-4]

What effect has advances in technology made in the Perry scheme? Two recent papers[4], [6] disagree on its applicability. One states that Perry may no longer be an accurate intellectual development model[4] while another states that Perry is the only viable model for engineering education[6]. There are also divergent views on the effects of introducing students to the concept of intellectual development?[6]

Recommendations:

According to Battaglini and Schenkat, the Perry model suggests that some instructor expectations of students are not attainable, because the student has not reached the appropriate level of cognitive development[5]. This is further supported by Vygotsky’s Zone of Proximal Development, where students may not be able to cope with challenges more than one Perry level above their current development[7].

According to Felder and Brent, the following conditions foster intellectual growth:
A. Variety and choice of learning tasks
   1. Varied problem types
   2. Varied levels of assignment definition and structure
   3. Choice on assignments, tests, and grading policies
B. Explicit communication and explanation of expectations
   1. Instructional objectives covering high-level tasks
   2. Study guides and tests based on the objectives
C. Modeling, practice, and constructive feedback on high-level tasks
   1. Assignment of relevant tasks and modeling of required procedures
2. Practice in assignments followed by inclusion of similar tasks on tests

D. A student-centered instructional environment
   1. Inductive learning (problem/project based learning, guided inquiry)
   2. Active and cooperative learning
   3. Measures to defuse resistance to student-centered instruction

E. Respect for students at all levels of development
   1. A sense of caring about students
   2. Awareness of and respect for current levels of development while promoting higher levels[6]

According to both Pugh and Kloss students can be encouraged to develop away from Perry’s dualism in the following ways.
1. Provide ample experience dealing with different viewpoints, conflicts, and paradoxes
2. Find the structure of each point of view, breaking it up into smaller parts, perhaps for example using an argument structure like issue, position, support, outcome.
3. Constantly reinforce alternative viewpoints and the unlikelihood of only one right answer to any complex problem
4. Require students to explain their value judgments explicitly and clearly
5. Challenge over-generalizations, appeals to authority, etc.
6. Support the legitimacy and relevance of students’ own experiences and views
7. Support changes of views when evidence supports such change[4,9]

According to King and Kitchener, common suggestions for providing the appropriate environment for encouraging students to progress to the next stage of intellectual development in the King-Kitchener Model are:
1. Show respect for students’ assumptions regardless of developmental stage
2. Discuss controversial, ill-structured issues with students throughout their educational activities
3. Create many opportunities to analyze others’ points of view for their evidentiary adequacy
4. Teach student strategies for systematically gathering data, assessing the relevance of the data, evaluating data sources, and making interpretive judgments based on the available data
5. Give students frequent feedback, and provide both cognitive and emotional support for their efforts
6. Help students explicitly address issues of uncertainty in judgment-making and to examine their assumptions about knowledge and how it is gained
7. Encourage students to practice their reasoning skills in many settings, from their other classes to their practicum sites, student organizations, residence hall councils, and elsewhere, to gain practice and confidence applying their thinking skills[8],[10]

Instructor knowledge of intellectual development models helps in setting appropriate expectations for the students and setting the appropriate conditions to promote student intellectual development. While there are differing views on which intellectual development model most accurately assesses students, each modeling system adds to the greater understanding of the student’s journey in the educational process.

References:

Annotated readings:
Perry Schema
Annotated Bibliography:
1. **The future of engineering education. I. A vision for a new century**
   A Rugarcia, RM Felder, DR Woods, JE Stice... - Chemical Engineering Education, 2000 - nc.edu
   ... Keep the undergraduate laboratory running and periodically modernize ... Education, 31(2), 106–107 (1997 ... Activities to Stimulate Intellectual Development in Perry ...
   [Cited by 73](http://www.arp.sprnet.org/default/inserv/INSERVE05_06/understanding_differences.pdf)
   This paper focuses on the new ABET standards from 2000, and the necessary changes in engineering education with respect to ensuring future engineering school graduates have the necessary knowledge, skills and attributes.

2. **The Intellectual Development of Science and Engineering Students. 2. Teaching to Promote Growth**
   RM Felder, R Brent - Journal of Engineering Education, 2004 - nc.edu
   ... education by Karl Smith [34] is particularly suitable for addressing the learning needs of students across the spectrum of levels of intellectual development ...
   [Cited by 26](http://www.arp.sprnet.org/default/inserv/INSERVE05_06/understanding_differences.pdf)
This paper focuses on how to encourage intellectual development with respect to the Perry and Baxter-Magolda models in a classroom by: varying and choice of learning tasks; explicit communications and explanation of expectations; model, practice, and constructive feedback on high-level tasks; student centered instructional environment; an attitude or respect and caring for students at all levels of development.

3. *Aging, adult development, and work motivation*
R Kanfer, PL Ackerman - Academy of Management Review, 2004 - ageingatwork.eu
Page 1. AGING, ADULT DEVELOPMENT, AND WORK MOTIVATION RUTH KANFER PHILLIP ... distant future. BASIC TENETS OF AN ADULT LIFE-SPAN APPROACH Life ...
Cited by 77
This paper focuses on an adult life-span approach to intellectual development where the basic tenets are loss, growth, reorganization and exchange. This paper also discusses fluid intellectual abilities and crystallized intellectual abilities and shows that as one ages fluid intellectual abilities go down, but there are gains in crystallized intellectual abilities.

4. *What is collaborative learning*
BL Smith, JT MacGregor - Collaborative learning: A sourcebook for higher education, 1992 - evergreen.edu
... increased student achievement and more complex intellectual development (MacGregor, 1991 ... Washington Center for Improving the Quality of Undergraduate Education ...
Cited by 108
This paper defines collaborative learning as a variety of educational approaches involving joint intellectual effort by students and teachers. The techniques summarized are collaborative learning approaches, cooperative learning, problem-centered instruction, guided design, case studies, simulations, writing groups, peer teaching, discussion groups and seminars, and learning communities.

5. *Collaborative learning: Its impact on college students' development and diversity*
AF Cabrera, JL Crissman, EM Bernal, A Nora, PT ... - Journal of College Student Development, 2002 - education.umd.edu
... collaboration. In 1997, for instance, the Kellogg Commission challenged colleges and universities to improve undergraduate education. ...
Cited by 42
This paper discusses a study of 2050 college sophomores across 23 institutions examining gender and ethnic differences in terms of preferences toward collaborative learning, effects of collaborative learning, and determinants of openness to diversity. This study did show a 6.6-13.2% improvement on student outcomes of those using collaborative learning.

6. *Integrative learning: Mapping the terrain*
MT Huber, P Hutchings - 2004 - homepage.mac.com
... about students’ personal and intellectual development as thinkers ... can be traced to adult learning and ... the role of reflection in undergraduate education has ...
Cited by 29
This paper defines integrative learning as learning to help students develop habits to make informed judgments in personal, professional and civic life. Some of the techniques discussed include “learning portfolios”, capstone design projects, “self-directed learning”, and “learning how to learn”.


8. Barbara M. Olds, Ronald L. Miller and Michael J. Pavelich, “Measuring the Intellectual Development of Engineering Students Using Intelligent Assessment Software, ICEE2000 proceedings available on-line at: http://www.ineer.org/Events/ICEE2000/Proceedings/papers/WC8-3.pdf This paper discusses software that will assess a student’s intellectual development in accordance with a simplified view of the Perry Model using positions: 2, 4 and 6 only. The software is called Cogito and uses four open ended scenario based questions on overpopulation, college education, tax rebates and nitrate contamination. The software has been compared to over 50 traditional interviews with high schoolers, undergraduate students, graduate students and faculty. The Cogito software did well on Perry positions below 5, but showed more scatter than expected above Perry position 5.

9. Wise, J., Lee, S.H., Litzinger, T.A., Marra, R.M., and Palmer, B., “A Report on a Four-Year Longitudinal Study of Intellectual Development of Engineering Undergraduates,” Journal of Adult Development, Vol. 11, No. 2, 2004, pp. 103–110. This paper describes a four year longitudinal study using the Perry Intellectual Development Model where some of the freshman were given a first year engineering design course. This showed marked higher position after the first year, but by the third year there was no difference between those who had the freshman design course and those that had not. The paper also concludes that open ended design problems should be included in the first-year and supported throughout the curriculum to maximize intellectual development using the 9 Perry positions.

10. Why learning communities? Why now
KP Cross - About Campus, 1998 - doso.wayne.edu
... encourages this low level of personal and intellectual development in its ... Seven Principles for Good Practice in Undergraduate Education.” The Wingspread ...
Cited by 93
This paper defines learning communities as groups of people engaged in intellectual interaction to learn. There are three principal reasons philosophical, research based and pragmatic. The reason for this move now is the changing epistemologies to improve higher education institutions ability to educate students for work and service.