Issues in Intelligence & Testing

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Overview

These lesson plans reflect activities from the final two days of a 9-day instructional unit on Intelligence and Testing in an Advanced Placement Psychology course. In my classroom, students encounter this unit later in the year, and they would have previously received instruction on topics such as Research Methods & Statistics and Biological Bases of Behavior. In these lessons, I require students to apply some of that "old" information, both from this unit and prior ones, to these "new" topics. For that reason, I have listed requisite background knowledge for each day's instruction. If using these activities with students unfamiliar with the important background information, timing of the activities may have to be adjusted so the instructor can provide appropriate context for students.

Day 1 of this lesson plan requires students to consider the nature-nurture issue as it relates to intelligence. They examine their own beliefs about the nature and nurture of intelligence, explore results of twin and adoption studies, and connect these ideas to Carol Dweck's research on the importance of mindset. The aim of the lesson is that students understand both the research regarding genetic and environmental influences on intelligence *and* how our beliefs about the rigidity of intelligence influence our behaviors and emotional responses to setbacks.

In Day 2 of this lesson plan, "Testing Goes to Court," students examine the 1979 case of Larry P. vs. Wilson Riles. I developed this lesson after having to study this and other lawsuits involving test results as part of a graduate course in psychological testing. In this California lawsuit, lawyers representing Larry P., an African American student who was placed in special education classes on the basis of IQ test results, argue that his 14th Amendment rights were violated. At the heart of the matter is whether standardized tests of intelligence are racially biased. Students will examine the case, apply previous knowledge gleaned from the unit's instruction, and attempt to arrive at a decision.

All materials and relevant resources are accessible via the hyperlinks embedded in this document.

Day 1: Nature & Nurture of Intelligence

TOPSS National Standards Addressed:

Standard Area: Intelligence
Content Standard 3: Issues in intelligence
Students are able to (performance standards):

3.1 Discuss issues related to the consequences of intelligence testing.
3.2 Discuss the influences of biological, cultural, and environmental factors on intelligence.

Materials Needed:

Handout: Your Beliefs About Intelligence
Handout: Nature & Nurture: Using Correlations to Determine Genetic Influence
Slides: The Nature & Nurture of Intelligence (and appropriate projection equipment)
2-3 Rubber Bands (different sizes and thicknesses)

Essential Background Knowledge:

- Understanding of correlation coefficients and scatterplots
- Familiarity with twin studies and adoption studies (e.g., should understand differences between identical and fraternal twins)
- Understanding of what is meant by the "nature-nurture issue" in psychology.

Procedure:

Activity 1: Your Beliefs About Intelligence *(10-15 minutes; timing flexible)*
Begin by distributing the handout, Your Beliefs About Intelligence[1], to students. Note that two copies of the exercise are printed per page, so only one half-sheet per student is needed. Have students respond to each item using the scale provided (A = agree, M = maybe, D = disagree).

Once students have recorded their answers, to stimulate an engaging discussion, choose an item from the list and have students arrange themselves this way: those who agree should stand on one side of the room, those who disagree stand on the other side, and those who selected "maybe" should position themselves in the center.

Inform students that the "agree" side and the "disagree" side will each share their reasoning, and in doing so they should attempt to convince the "maybes" to join them. Anyone can decide to change where they stand at any time (moving from "maybe" to "disagree" or from "agree" to "maybe") as their thinking changes.

[1] I developed this exercise by drawing items from this interactive mindset quiz available online. While the online quiz might be useful, too, I want students to explore these ideas prior to learning about Dweck's model. Then, when information is presented on it later, they have something to connect it to.

In my experience, students tended to be rather uniform in their responses to Items 1 and 2, but a diversity of opinions appeared by Items 3 and 4. Item 7 also sparks good discussion, as students will readily give examples of musical and athletic talents in addition to traditional academic skills.

It is not necessary to discuss *every* item on the handout in this manner, although you may choose to do so if time allows. In my experience, we usually reach a point where a student says something to the effect of, "Wait, what *does* the research say about this? Don't genes matter?" or "There has to be a 'right' answer to this! What is it?" If that happens, the activity has been successful, as students are now thirsty for information about the nature and nurture of intelligence, so I use it as an opportunity to transition to the next activity (e.g., "I'm glad you asked! We're going to explore that exact question today!").

Activity 2: Nature & Nurture: Using Correlations to Determine Genetic Influence *(10-15 minutes)*
As students return to their seats have them select a partner to work with as they complete the next exercise.

Students may already have recognized that the statements they were just working with related directly back to the Nature-Nurture issue in psychology (if not, you might take a moment to review this concept). Ask students to recall that psychologists explore the nature-nurture issue via twin studies and adoption studies.

As you distribute the handout[2] (Nature & Nurture: Using Correlations to Determine Genetic Influence), explain to students that they will be examining data from twin and adoption studies to draw conclusions about the nature and nurture of intelligence. They should work with their partners to interpret the scatterplots shown and should be prepared to share their conclusions.

Allow 10 minutes or so for work time, and circulate throughout the classroom to provide help to teams that appear in need of assistance.

Select teams to share conclusions and interpretations of the three problem sets.

1. The first, a comparison of MZ twins' and DZ twins' IQ scores, suggests a genetic influence, since MZ twins (who are more genetically similar), score more similarly on IQ tests.
2. The second, a comparison of MZ twins reared together and MZ twins reared apart, suggests room for environmental influence, since MZ twins reared together are more similar in IQ scores that those raised apart.
3. The third problem set provides an example of how adoption studies can be used to understand genetic influence. This set of three scatterplots shows that measures of verbal ability in children match much more closely to their biological parents' scores than to their adoptive parents scores, suggesting genetic influence.

[2] I developed this exercise after finding that students often have a hard time interpreting bar graphs that compare levels of correlation between groups (such as the one found at the conclusion of the handout and those frequently found in textbook sections discussing the nature and nurture of intelligence). I took the levels of correlation indicated on these graphs and created scatterplots for them using this online tool. Not only does this help them visualize what is meant by the bar graphs, but it provides helpful practice in interpreting scatterplots and correlation coefficients.

Then, draw students attention to the bar graph at the bottom of the handout. It may help to simultaneously project Slide 2 from the accompanying slides. Illustrate to students the connection between the correlational data they just examined and the bar graph that compiles those results (e.g., the y-axis denotes the strength of the correlation, so the .85 correlation between MZ twins reared together is represented by the tallest bar on the graph). Examining these correlations together reveals influence of *both* nature and nurture on intelligence.

Slide 3 can be used to further interpret the results from adoption studies (problem set 3 on the handout). It illustrates that correlations between adoptive children and their birth parents *increase* with time on measures of verbal ability, suggesting a genetic (nature) influence.

Use Slide 4 to present information to students about what aspects of "nurture" have been shown to predict intelligence test scores. (NOTE: View in presentation mode to see all of the elements. Some do not appear until you click through). This slide includes information on:

- The connection between early social deprivation and poverty and lower IQ scores. The CT scan image that appears is from Perry and Pollard's (1997) research on the neurological effects of neglect.
- The importance of schooling and early childhood interventions.
- Exposure to environmental toxins and its impact on intelligence. The final image in the slide shows children's drawings of a person. This is taken from Guillette et al.'s (1998) research on pesticide exposure, comparing children who were raised in the Yaqui valley in Mexico to those raised on the nearby mountainside (who had much less exposure to pesticides).

Activity 3: Rubber Band Analogy (2 min)
To summarize the interaction between nature and nurture as it relates to intelligence, I like to use this simple metaphor. It helps students understand how this is not a matter of nature OR nurture, but that the two forces interact.

Take out 2-3 rubber bands of different sizes/thicknesses. Select one, and hold it up for students to see. Suggest to them that the rubber band represents one's genetic predispositions surrounding intelligence. Placing two fingers inside of the rubber band to hold it tight, but without stretching it, show students that the length of the unstretched loop might be predetermined, but one can do things to stretch it. For example, environmental factors like quality schooling and putting in effort to learn new skills can further "stretch" one's limits. Alternatively, poor environmental factors like childhood neglect can limit stretch, much like an old (inflexible) rubber band becomes rigid when exposed to the elements. (Note: While stretching the rubber band, be careful not to accidentally launch it across the room!)

While environmental factors influence how much we can "stretch" our potential, we also come into the world with different rubber bands (genetic endowments). Show students the other rubber bands. A genetically determined developmental disability might be represented by a shorter, thicker rubber band: a nurturing environment will still help such individuals reach their full potential, but the genetic endowment constrains the impact of the environment. Child prodigies who graduate from college at age eleven most likely have very long,

flexible “rubber bands” (genetics that allow them to quickly capitalize on a supportive environment), contributing substantially to their exceptionality.

Activity 4: Growth v. Fixed Mindset (5 minutes)
The use of the rubber band analogy provides an excellent transition to the lesson’s final topic: Carol Dweck’s research on mindset. **Slide 5** can be used to prompt the transition as well.

Explain to students that researcher Carol Dweck (2006) found that, as we think about intelligence, what we choose to focus on—the size of the rubber band or the things we can do to stretch it—has significant consequences. As Dweck explored beliefs about intelligence, she found that a “growth mindset,” one that focused on how intelligence can increase with practice and effort, predicted greater success and more positive reactions to setbacks.

For a practical illustration of growth mindset, you can show this 90 second (free, publicly available) video from Khan Academy called “You Can Learn Anything.” This is embedded in **Slide 6**, for your convenience.

Slide 7 provides a helpful chart for illustrating the differences between growth mindset and its counterpart, “fixed mindset.” This can be used to point out how a fixed mindset, which holds that intelligence cannot grow, results in avoidance of challenge, distress and giving up in response to setbacks, and lower performance overall. Dweck found that simply teaching students to adopt a growth mindset, but informing them of the brain’s ability to grow stronger with use (“like a muscle”) helped them perform better in school. This illustrates a very important point: *Our beliefs about intelligence matter!*

Closing Activity:
Have students return their attention to the statements on the Your Beliefs About Intelligence handout used earlier in the class period. Ask them to take a moment to identify which ones reflect a Fixed Mindset and which ones represent a Growth Mindset. Students should be able to determine that the odd-numbered items reflect beliefs associated with a fixed mindset, and even-numbered items reflect a growth mindset.

If time allows, you might ask students what they plan to do to “stretch their rubber bands” today, as this question helps them apply and internalize Dweck’s concept of growth mindset.

Assessment:
Informal. Can collect student written responses to questions on correlation handout and/or beliefs handout if desired.

Extension Opportunities:
Discussion Question: Carol Dweck’s research suggests that overemphasizing the influence of “nature” when we think about our own intelligence can have negative consequences. Is there any danger to overemphasizing “nurture”?

References:

Dweck, C. S. (2006). *Mindset: The new psychology of success*. New York: Random House.

Guillette, E. A., Meza, M. M., Aquilar, M. G., Soto, A. D., & Garcia, I. E. (1998). An anthropological approach to the evaluation of preschool children exposed to pesticides in Mexico. *Environmental Health Perspectives*, *106*(6), 347–353.

Perry, B. D., & Pollard, D. (1997). *Altered brain development following global neglect in early childhood.* Society For Neuroscience: Proceedings from Annual Meeting,New Orleans, 1997.

Day 2: Testing Goes to Court

TOPSS National Standards Addressed:

Standard Area: Intelligence
Content Standard 3: Issues in intelligence
Students are able to (performance standards):

3.1 Discuss issues related to the consequences of intelligence testing.
3.2 Discuss the influences of biological, cultural, and environmental factors on intelligence.

Materials Needed:

Handout: Testing Goes to Court: The Question of Bias in Testing (one per student)
(For teacher reference) Suggested Answers: Testing Goes to Court
Slides: Group Differences in Testing and the Question of Bias (and appropriate projection equipment)

Essential Background Knowledge

- Understanding of the concepts of validity, reliability, and standardization
- Familiarity with the concept of stereotype threat (or, access to textbook for reference)
- Basic familiarity with the early history of intelligence testing (e.g., the original purpose of Binet's test, the eugenics movement, connections to US immigration law in the 1920s, etc.)
- Background reading on group differences in intelligence test performance and their potential causes.

Procedure:

Activity 1: Introducing the Topic (*5 minutes; more if additional background is required*)
Using Slides 1-3 in the accompanying materials, introduce the topic of the day's lesson.

Relay to students that one of the areas of intelligence research that draws the most interest (and the most controversy) concerns group differences in intelligence test scores. The intensity of this issue is connected to two rather troubling, but agreed upon, trends in group performance on intelligence tests: that 1.) racial groups differ in their average scores and that 2.) scores predict (and are sometimes used to determine) access to educational opportunities that impact later income and financial stability.

[*Note: Because my students are required to have previously read a section of their text that offers potential explanations for these achievement gaps, I usually raise that as a brief point of discussion before proceeding (e.g., "What do you remember from your text reading about possible causes of this trend?"). I want to make sure that my students are aware that cultural factors, including income and access to health and educational resources, are believed to underlie these racial group differences. I do not want them to proceed erroneously believing that such score differences reflect innate differences in ability. If your students have not had access to this information yet, I would highly recommend providing it before completing the next activity.*]

Inform students that they will be examining a court case that explores the complexity of these issues. However, make it clear to students (using Slide 3) that group differences in average performance must be interpreted carefully. For one, even in cases where groups differ in average score, there can be a great deal of overlap in the total score distribution. So, for example, knowing that an individual belongs to the lower performing group gives one little to no basis for predicting their score. And, group differences will be most visible at the extremes of the normal curve, as today's case will illustrate.

Activity 2: Investigation and Discussion - *Larry P. v. Wilson Riles* (30-40minutes)
Divide students into groups of 2-3 and provide each student with a copy of the handout, Testing Goes to Court: The Question of Bias in Testing.

Draw students' attention to the summary of the case on the back side of the handout. Alert students to the footnote and description of what "EMR" meant at the time. Although it is no longer considered appropriately sensitive, EMR at the time of this case stood for "educable mentally retarded," a special education classification that now is roughly equivalent to stating that someone has a mild cognitive disability.

The groups should use this handout to prepare for a discussion of the *Larry P*. case. They will likely need 20 minutes to read through the case, discuss it, and prepare answers to the discussion prompts found on the handout.

The remainder of the class time should be used to facilitate a large-group discussion of the case, using the question prompts on the handout as starting points. Key issues:

- Are intelligence tests racially biased? Did Larry P.'s lawyers provide convincing evidence of this?
- What is a just outcome for Larry P.? (Question 3)
- Do tests reduce or promote racial bias? (Question 4)

When discussing the question of bias in testing, it may be helpful to present **Slides 4 and 5** to students, as they illustrate two major approaches to understanding bias in testing. The second definition is the one used by psychologists and psychometricians, but courts and judges are not obligated to follow it.

Closing: Outcome of the *Larry P*. case (a few minutes; complete at end of class period)
Students will definitely want to know how the court ultimately ruled in this case, but I have deliberately left the details about the outcome out of the summary so as not to influence their answers. They may be begging you to reveal what actually happened by the end, so you don't want to leave them hanging.

In sharing this result, you'll want to note that it hardly settled the issue of racial bias in intelligence testing, as other courts ruled differently, and this case itself touched off several new lawsuits.

Here is a description of the decision from Kaplan and Saccuzzo (2009, p. 563):

"*Clearly persuaded by the plaintiffs, the judge declared that the tests are 'racially and culturally biased, have a discriminatory impact on African-American children, and have not been validated for the purpose of consigning African-American children into educationally dead-end, isolated, and stigmatizing classes.' Furthermore, the judge stated that the Department of Education had 'desired to perpetuate the segregation of minorities in inferior, dead-end, and stigmatizing classes for the retarded.'*

The effect of the ruling was a permanent discontinuance of IQ testing to place African-American children in EMR classes. The decision immediately affected all African American California schoolchildren who had been labeled as EMR. More than 6000 of these children had to be reassessed in some other manner."

The decision was immediately controversial. Some felt the decision was a victory, noting how it might prevent schools from using test results to create de-facto segregation within integrated schools. Others worried that it would actually hurt African American students, preventing them from getting special education services they actually needed. Meanwhile, an Illinois court hearing a nearly identical case (*Parents in Action on Special Education v. Hannon*) one year later did *not* find the WISC to be racially biased and issued a ruling upholding use of such tests in decisions about educational placement for African American children.

The Larry P. decision raised more questions than it answered, because as districts attempted to comply with the ruling, more issues emerged. The most bizarre example of this, in my opinion, is the *Crawford et al. v. Honig et al.* case in 1991. In this lawsuit, an African American mother who *wanted* her child tested because she believed he needed special education services was denied that service by the school district (citing the *Larry P*. case, which banned the practice). However, since use of IQ tests on white children was allowable per the ruling, and since the father of the child in question was white, *school officials suggested that the mother change her son's racial classification on school records, and then he could be legally tested* (Kaplan & Saccuzzo, 2009).

Students jaws will hit the floor when you tell them about this, regardless of how they felt about the outcome of the Larry P. case. I have frequently had students linger after class following this lesson, wanting to further discuss the social consequences of using intelligence tests and their current legal status. Even for those who do not stay, students leave the class saying things like, "Unbelievable!" or "What a mess!" or "I'm glad I'm not a judge!" I've found no better way to help them appreciate the complex consequences of intelligence testing.

Assessment:
Informal, via discussion. However, for a more thorough look at student understanding, the discussion preparation handouts could be collected if desired.

Extension:

As the *Larry P*. decision was just one in a long history of litigation regarding use of intelligence tests, one can easily add to students' exploration of this topic by including more court cases. In the past, I have sometimes had students break into groups/partners and given each group a different case to examine. After sufficient time for in-group discussion, each group shares the major details of the case and how they think the judge should rule. Significant lawsuits that may be worth exploring include:

Stell v. Savannah-Chatham County Board of Education
In this pre-*Brown v. Board* lawsuit, a county school district used mean IQ score differences between white and African American students to argue for a halt to the desegregation of its schools.

Hobson v. Hansen
In this 1967 case, a parent of African American children placed in the "basic" track within a desegregated school argued that use of group standardized ability tests was perpetuating segregation *within* schools. White students were placed into honors tracks and African American students into basic tracks on the basis of the test results.

Diana v. State Board of Education
In this California lawsuit, testing procedures for bilingual students came under consideration.

Parents in Action on Special Education v. Hannon
This Illinois class action lawsuit occurred less than one year after the *Larry P*. case, and even though the details of the case are wildly similar to the *Larry P*. lawsuit, the judge reach a decision that is virtually opposite of the one in the *Larry P*. case, finding no evidence for racial bias in standard tests of intelligence. Provides an excellent example of how the courts have differed in their understanding what constitutes of evidence for bias.

Crawford et al. v. Honig et al.
As mentioned earlier, this 1991 California case occurred as a direct extension of the Larry P. ruling. California schools were banned from using intelligence tests to place African American students in special education classes following that decision. In this lawsuit, an African American mother who *wanted* her child tested because she believed he needed special education services was denied that service by the school district (citing the *Larry P*. case). However, use of IQ tests on white children was allowable per the ruling, and since the father of the child in question was white, school officials suggested the mother change her son's racial classification on school records, and then he could be tested. Thus, this lawsuit claimed that the district was denying a public service on the basis of race.

Debra P. v. Turlington

This 1979 Florida lawsuit concerned the fairness of requiring African American students to pass the same minimum competency tests for graduation that were required of white students, when African American students (at that time) had spent their first several years of schooling in segregated facilities.

References:

Kaplan, R. M. & Saccuzzo, D. P. (2009). *Psychological Testing: Principles, Applications, and Issues*. 7th ed. Belmont, CA: Wadsworth.