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Fixed and Growth Mindsets: All Abilities Are Not Perceived Equally

Hannah Anderson
Psychology
The University of North Carolina at Asheville
North Carolina 28804 USA

Faculty Advisor: Dr. Melissa Himelein

Abstract

Do students believe that cognitive and creative abilities can grow and develop, or do they view such abilities as relatively fixed? Prior research has shown that growth-oriented views of intelligence predict students' academic success, perhaps because the perception of abilities as changeable leads to a stronger willingness to persist in the face of challenge. In addition, interventions aimed at encouraging growth mindsets in students have been shown to improve academic performance. Previous studies of growth mindset have most often focused on perceptions of the changeability of general intelligence or overall abilities. In contrast, this investigation will examine students' beliefs about the capacity for growth in specific types of abilities, many of which have not been examined previously. A 24-item survey, adapted from an existing measure of fixed and growth mindsets, was administered to groups of middle school and college students. The survey assesses students' mindsets about four domains of ability: creative (e.g., artistic ability), academic (e.g., math, reading), cognitive (e.g., working memory), and interpersonal (e.g., listening ability, empathy). Differences in student perceptions of each ability category were assessed, and middle school and college students' views were compared. Across both age groups, abilities tended to be viewed as relatively growth-oriented, but perceptions of different abilities were quite varied. Overall, college students tended to be more growth-oriented in their views than middle school students. The findings of this research have implications for educators, who could ideally design discipline-specific pedagogical strategies to encourage growth-oriented views, thereby motivating students' sustained effort and persistence in learning.

Keywords: Implicit Theories, Growth Mindset, Education

1. Introduction

Children gain insight about the world by sorting concepts and things into categories or "schemas"[17]. This method for making sense of new information is something that people maintain throughout life. On one hand, such classification is a powerful cognitive skill that bolsters efficiency. However, as research on bias and stereotyping have shown, it can also lead to oversimplification and misperception[3 8].

The human tendency to classify others also leads people to sort themselves into categories. Most people, at one time or another, decide that they are simply "not good" at something. Commonly-used descriptors of individuals such as "people person" or "artistic type" seem to indicate a belief that some people "have it" and others do not. These seemingly harmless concepts reflect what psychologist Carol Dweck calls implicit theories: enduring ideas people maintain of themselves. Implicit theories can be "growth" oriented, meaning that the ability or skill in question can be improved, or they can be "fixed," meaning that the ability or skill in question is perceived as unchangeable[6].

Common stereotypes feed fixed mindset perceptions, such as the idea that math is a "gift" or that math comes more easily to males than females[7]. According to Dweck, for many years the stereotype that women were not beneficiaries of the "math gift" persisted and female students were socialized to expect little improvement in the area[7]. Rattan and colleagues found that women have been influenced by instructors not to worry about improving in math because of

perceptions that women are unable to become capable mathematicians[20]. Yet, when female students are explicitly taught that they can improve in math, something important happens, and their performance improves[7 20]. Suddenly, the "gift" looks more like a skill that can be developed when a growth mindset is nurtured. Similar improvements in achievement have been shown among African American students after interventions emphasizing that knowledge and skills are malleable[2].

The fixed mindset belief that intelligence and other skills are hardwired can be damaging because it ignores many important features involved in the learning process. For example, learning is influenced by the environments in which people develop, their response to learning challenges, and the learning resources available to them. Growth mindset has been shown to be positively linked to the ability to persist in the face of challenge, often referred to as tenacity[5 6]. In several academic areas, from math to creative writing, studies have demonstrated that it is possible to improve skills with effort, practice, and persistence[6 10 15].

Dweck's research has also demonstrated that students' mindsets are associated with academic outcomes; specifically, growth mindsets are positively correlated with better academic grades[6 7]. Likewise, in a study Blackwell and colleagues conducted with struggling junior high students, an experimental group was given a "growing ability" intervention while a comparison control group received a separate quality intervention. After eight sessions, the growth group showed sizeable improvement, significantly outscoring the control[4]. Such positive outcomes have been found in other growth mindset intervention studies as well[2 10]. Dweck's work, along with many other investigations, suggests that when faced with difficulties, growth-oriented students persist and eventually improve academic outcomes[5 6 15 21].

While most research on growth mindset has focused on its impact on academic skills, some recent studies have examined its relationship to other types of abilities. Karwowski developed a creative mindset scale and found that as with academic skills, creativity has its own implicit theories associated with it, "creative mindsets"[14]. Karwowski showed that participants with fixed creative mindsets tended to have lower confidence in their creative abilities, known as creative self-efficacy[14]. In a different study of creative mindsets, researchers adapted Dweck's instrument to assess perceptions of the growth vs. fixed nature of creativity, finding that growth mindsets were positively correlated with creative self-efficacy[13]. Such studies demonstrate that growth mindset is not only important for learning in academic domains but for success in other ability areas as well.

As with the impact of gender on mindset, it is likely that other individual or cultural variables also play a role in the mindsets that people hold. For example, does age or maturity influence implicit theories of abilities? The relationship between fixed or growth beliefs and age has not been explicitly addressed by research to date. Most studies have focused on a single age population rather than comparing mindset across developmental stages. For example, Dweck's research on beliefs about math focused on fifth graders[7], while in other studies, she examined college students[11]. However, in a study conducted by Chen and Tutwiler, perceptions of growth and fixed mindset in relation to science[5] were examined in a sample of both sixth and tenth graders. The researchers assumed the tenth graders would show more fixed attributes than the sixth graders, given trends towards lower motivation in older students. However, in contrast to expectations, a larger portion of the tenth graders exhibited a growth mindset. Attending to possible age differences in mindset may be important for understanding the context involved in implicit theories of ability.

This study hypothesizes that variability will be found in the mindsets of participants depending on the ability questioned. Furthermore, we predict that abilities that have been covered in school directly and have been tracked for progress such as reading, will be relatively growth oriented. In contrast, we hypothesize that areas of ability that are not directly discussed, especially in terms of progress, will be rated by participants as fixed abilities. A difference between the middle school and college population on ability specific mindsets is also expected. Specifically, because of the Chen and Tutwiler study we hypothesize that college students will have a stronger growth mindset orientation for more items.

2. Method

2.1 Participants

A sample of undergraduate students (n=105) was drawn from junior- and senior-level general education humanities classes at a small, public liberal arts college. Of these students, 19.8% were from majors associated with humanities departments, 31.7% were from natural sciences, and 48.5% represented social sciences. More participants identified as female (61%) than male (38.1%), their mean age was 23.7 years (SD=6.6), and most were seniors (75.2%). The majorit2.2y of the sample identified as White (83.8%), with 6.7% of participants Latino/a, 4.8% African American, and the remaining a different ethnicity(ies).

An additional sample of middle school students ranging from 6th to 8th grade was also obtained (n=86). These students were surveyed during homeroom sessions at a small, public charter school. More middle schoolers identified as female (53.5%) than male (44.2%), and their mean age was 12 years (SD=.88). Sixth graders were the largest group in the middle school sample (44.2%), while 8th graders made up the second largest group (31.4%). The majority of the sample identified as White (87.2%), with 3.5% identifying as Latino/a, 2.3% as Asian American, and the remaining a different ethnicity(ies).

2.2 Measures

The survey used in this study was adapted from the Dweck Mindset Instrument[8]. Participants rated 12 types of abilities according to their perceived growth-oriented or fixed natures. The ability areas consisted of attention span, math, reading, listening, creative writing, art, public speaking, foreign language, working memory, empathy, spatial, and music. For abilities, or domains, that required more complex understanding such as spatial ability, short descriptions were provided (e.g., "being able to mentally picture and understand objects in three dimensions, e.g., building, visualizing, and designing objects.")

Students completed two items for each domain (one assessing growth mindset and one assessing fixed mindset), resulting in a 24-item survey. Both types of items were used due to previous research finding that growth and fixed mindsets do not exist on the same continuum; rather, they are concepts that should be conceived of as distinct but strongly (negatively) correlated[13 14].

The growth mindset items followed the structure, "No matter how much ____ you have, you can always change it quite a bit." For example, the growth mindset item for public speaking was presented as follows, "No matter how much *public speaking ability* you have, you can always change it quite a bit." The fixed mindset items followed the structure, "You have a certain amount of _____ and you really can't do much to change it." For the same ability of public speaking, the corresponding fixed mindset item was, "You have a certain amount of *public speaking ability* and you really can't do much to change it."

Each of the 24 items were rated by participants using a 6-point Likert scale, per Dweck's scoring system (1=strongly agree, 6=strongly disagree). Lastly, participants were asked to complete fill-in-the-blank statements covering demographic information.

2.3 Procedure

To collect data from college classrooms, permission was first obtained from professors who instructed general education junior- and senior-level courses. The researcher then introduced and distributed the surveys at the start of the class periods. In addition, college students were sampled as they waited for junior- and senior-level lectures in other general education classes to begin.

The middle school participants were given passive consent forms to take home to parents or guardians, so that parents or guardians had the option to exclude their children from the study. All parents (passively) consented to their children's participation.

In both groups (college and middle school students), participants were given a verbal explanation of the research and instructions prior to completing surveys. In addition, the survey included a written set of directions for its completion. All students were assured that the survey was not a requirement and that they could choose to terminate their participation at any time.

The survey took approximately 10-15 minutes to complete. At both the college and the middle school, the survey process was followed up by a brief explanation of growth and fixed mindsets. Data were analyzed in SPSS.

3. Results

In order to examine participants' perceptions of the 12 different ability areas, means for each ability area were calculated. The means and standard deviations for each of the 24 items, across all participants, are displayed in Table 1. On the growth mindset items (column 1), lower numbers represent a greater belief in a growth mindset. On the fixed mindset items (column 3), lower numbers represent a greater belief in a fixed mindset.

According to Dweck's instructions for scoring the Dweck Mindset Instrument[8], scores of 1-3 on the growth items (column 1) are indicative of a growth mindset, while scores of 4-6 represent a more fixed mindset. Scores between 3

and 4 are considered "undecided". Likewise, fixed items (column 3) between 1-3 show a fixed mindset, while scores between 4-6 represent a growth mindset. Again, scores between 3 and 4 are considered undecided.

Among the 12 growth mindset items (column 1), participants leaned toward a growth mindset on 10 of the items (scores < 3.0). Only working memory and spatial ability fall outside of this range, and both of these are in the undecided category (scores between 3 and 4). The range among all growth items was .73 on the 6-point Likert scale. Within the growth-oriented items, participants viewed reading ability as the most growth-oriented and attention span as the least growth-oriented.

Among the 12 fixed mindset items (column 3), participants were undecided in their view of 11 of the items (scores between 3 and 4), viewing just 1 as relatively growth-oriented (score >4.0). The range among all items on the fixed scale was 1.04. Spatial ability was perceived as the most fixed ability, while foreign language represented the most growth-oriented ability area.

Table 1: Overall Means and Standard Deviations of All Items, By Domain (*n* =191)

Growth Item*	**Mean (SD)**	**Fixed Item****	**Mean (SD)**
Creativity Domain			
Music Art Creative writing	2.73 (1.36) 2.76 (1.33) 2.83 (1.31)	Music Creative writing Art	3.58 (1.54) 3.50 (1.50) 3.40 (1.56)
Interpersonal Domain			
Listening Empathy Public speaking	2.61 (1.14) 2.65 (1.32) 2.71 (1.27)	Public speaking Listening Empathy	3.77 (1.50) 3.61 (1.51) 3.46 (1.60)
Academic Domain			
Reading Math Foreign Language	2.47 (1.28) 2.70 (1.26) 2.72 (1.44)	Foreign language Reading Math	4.16 (1.53) 3.88 (1.74) 3.74 (1.54)
Cognitive Domain			
Attention Span Working Memory Spatial Ability	2.98 (1.24) 3.03 (1.31) 3.20 (1.30)	Attention Span Working Memory Spatial Ability	3.27 (1.33) 3.24 (1.35) 3.12 (1.41)

*Lower means indicate greater belief in a growth mindset.
**Higher means indicate greater belief in a growth mindset.

In order to evaluate whether college students differed from middle school students in their perceptions of the 12 abilities, a one-way multivariate analysis of variance (MANOVA) was conducted. There was a statistically significant difference in perceptions of the abilities between the two groups, $F(24, 166) = 2.03$, $p = .005$, Wilk's $\lambda = 0.773$.

Follow-up testing revealed that seven items significantly differed between college and middle school students. Table 2 contains the means and standard deviations of these 8 items, grouped by student population. In 7 of the cases, the direction of the difference was the same. That is, college students viewed these abilities as more changeable than middle school students. These 7 abilities were as follows: creative writing, attention span, math, empathy, reading, listening, and public speaking. The largest difference in perception found between the two populations was present in the reading ability item (difference of 1.09). The college population mean (4.37) indicated a "growth mindset" (>4), and the middle school mean (3.28) indicated a perception in the undecided range (scores between 3 and 4).

The one statistically significant difference that did not reflect the overall pattern of greater growth among college students was in the area of artistic ability. For this type of item, a lower score indicates growth-mindset. Therefore,

the middle school average (2.48) was at the level of growth mindset (<3) and the college average (3.00) is just past the threshold of the undecided category. The difference found between the populations was (.52). Artistic ability was viewed as an ability that can be grown by the middle school sample (mean <3) whereas college students were in the undecided range (mean between 3 and 4) on this item.

Table 2: Means and Standard Deviations of Items Differing between Middle School (*n* =86) and College Students (*n* =105)

Item*	**Middle School Mean (SD)**	**College Student Mean (SD)**
Creativity Domain		
Art*	2.48 (1.35)	3.00 (1.27)
Creative writing**	3.23 (1.64)	3.72 (1.33)
Interpersonal Domain		
Listening**	3.16 (1.53)	3.98 (1.39)
Empathy**	3.16 (1.62)	3.70 (1.54)
Public speaking**	3.49 (1.56)	4.01 (1.42)
Academic Domain		
Math**	3.43 (1.66)	3.99 (1.39)
Reading**	3.28 (1.80)	4.37 (1.53)
Cognitive Domain		
Attention span**	3.05 (1.24)	3.46 (1.39)

*Lower means indicate greater belief in a growth mindset.
**Higher means indicate greater belief in a growth mindset.

4. Discussion

This study examined a broad range of academic, cognitive, creative, and interpersonal abilities with the purpose of understanding student perceptions regarding the potential for change in each area. Overall, the participants leaned toward growth mindsets, as indicated by scores on all 24 items (11 scored in the growth range, 13 in the undecided range, and none in the fixed range). In other words, participants' perceptions show that they believe most abilities have differing degrees of potential for growth, and they do not believe any are especially unchangeable.

The results indicated that students across two age groups tend to most strongly perceive reading ability, listening ability, and empathy with a growth mindset. The other items found in the academic domain (math, foreign language) and interpersonal domain (public speaking) were also perceived as growth-oriented by participants, but not as strongly. This suggests that abilities honed in the school setting (e.g., reading) as well as abilities learned socially (e.g., listening)

are viewed as having a high potential for improvement. However, as expected, there was variability in the implicit theories regarding abilities within each of these domains.

It is possible that academic abilities, as subjects found in school, are considered changeable because students associate these subjects with the progress they have made in the past. Unlike abilities in the cognitive domain (e.g., spatial ability or working memory), students have actively worked on these skills in a structured environment that has tested and retested progress.

Research on the effectiveness of interventions designed to encourage growth perceptions also supports these findings. For example, the study by Blackwell and colleagues on the impact of teaching junior high school students about "growing ability" involved illustrating for students that intelligence is changeable over time as a result of studying and practice[4]. With regard to reading, the most growth-oriented ability, perhaps students have already indirectly been witness to "growing ability" in the process of learning to read, and consequently they may more easily perceive this ability as one that develops with effort over time. For example, reading levels (e.g., first grade reading level) shows a clear progression of which students are likely aware.

The degree of growth was relatively higher in the area of reading than in math. Although math, like reading, is an explicit school subject in which students are regularly tested and retested, perhaps there is a difference between the two subjects in socially-constructed beliefs about them. As noted earlier, beliefs - or stereotypes - about math may create the perception that math is a fixed ability, or gift, with which some people (e.g., males) are born[7]. This paradigm of thinking could result in lower student achievement[7]. For example, if students feel that math is difficult, they may interpret the difficulty as a lack of inherent talent for mathematics, believing that "they aren't good at math." Consequently, such students may avoid math and not learn the steps to overcoming math challenges.

Empathy and listening ability were also perceived across both age groups to be growth-oriented skills. Like academic abilities, students may have direct experience with developing these interpersonal skills over time. Though not school subjects, abilities such as listening and empathy are important social skills, necessary for building successful interpersonal relationships. School classrooms certainly offer an opportunity to practice listening ability, and students may have seen themselves improve.

Cognitive skills appear, overall, to be the relatively least growth-oriented. One of the cognitive skills, attention span, showed the lowest degree of growth orientation, and the other two abilities in this domain, spatial ability and working memory, were both in the undecided range. Perhaps cognitive skills are perceived as more ambiguous than academic skills, and therefore difficult to improve. Unlike reading or math, there are not public school classes dedicated to explicitly honing working memory. Furthermore, while success stories of people working hard and improving in other areas of ability (e.g., reading) are common, cognitive skills typically go undiscussed. However, there are studies that support the notion of attention span and spatial ability as grow-able skills[16 19], and in a large scale meta-analysis of working memory interventions, it was concluded that positive improvements in fluid intelligence were found after short term working memory training[1]. Yet, it is unlikely that students are aware that growth is in fact possible in these areas.

The present study also compared growth and fixed perceptions between middle school students and college students. In doing so, seven abilities illustrated a pattern of difference between the middle school and college groups, with college students emerging as overall more growth-oriented than middle school students. The abilities that were significantly different included each of the interpersonal domain items (listening, empathy, and public speaking), two academic domain abilities (math and reading), one cognitive domain item (attention span), and one creative item (creative writing).

As noted earlier, interpersonal skills (i.e., empathy, listening, public speaking) may be perceived as more capable of growth because of the proof of development that students witness in themselves over time. This idea is supported in that the college students, with almost 12 more years of life experience than middle-schoolers, were significantly more likely to lean toward a growth-mindset.

Of the three interpersonal skills, public speaking ability was most discrepant between college and middle school students. In addition to the standard requirements to listen in classroom settings, students in college have generally had to practice public speaking as well. In the present sample, all college students are required to demonstrate "oral competency" prior to graduation. Consequently, similar to participants' experiences with other school subjects such as reading and math, college students, largely upperclassmen, may have been predisposed to viewing public speaking as a growth ability.

Among the academic abilities, math and reading stood out as significantly different between the age populations. College students viewed these areas as being more grow-able than did the middle school students. Once again, reading emerged as especially growth-oriented, with middle school students scoring in the undecided range and college students in the growth range. Again, this may reflect the incremental growth that participants experience over time;

college students have had a lot more time to experience reading improvements over time as well as to reflect on their achievements.

The one ability that fell outside of the pattern of direction established by the other areas of significant difference was artistic ability. On this item, middle school students had a growth mindset and college students had an undecided mindset. This unusual finding may stem from a measurement issue that may reflect a more complex area of ability that the creative domain is just scratching the surface of.

In part, this could reflect the way students define creativity. In some research two divergent perceptions of creativity have been shown to exist. Some people define creative abilities as representing a "trait" found only in rare circumstances. For example, they would think of artistic ability as existing among famous artists. In others, it is the learned skills that improve over time[12 18]. For example, they may picture a friend who practices artistic abilities regularly and has shown improvements. Depending on which type of artistic ability the study participants perceived, the answers may have varied. In the "creative mindset" work done by Karwowski, it was hypothesized that people who are considered "lay-people" in the area of creative abilities may define "creative abilities" differently than "experts"[14]. This is why the creative domain used in the present study was divided into more specific areas of ability (i.e., writing, art, music). However, in the case of art, the type of art pictured by study participants (e.g., painting, sculpting, etc.) would theoretically even further change the mindset attributed to the skill[14].

The present study supported creative mindset researcher Karwowski's assertions that fixed and growth mindsets do not fall on opposite ends of a continuum; instead, they are two separate mindsets that can coexist[14]. The growth and fixed items for each ability were typically negatively correlated but not strongly enough to show them as being opposites on a continuum.

5. Conclusion

This study found that all abilities are not perceived as equal in terms of their changeability. Areas that appear to be viewed as most growth oriented are those that are explicitly taught to everyone, and in which practice and experience are expected to result in improvement. The more ambiguous abilities examined here appeared to be viewed with less of a growth orientation. This study also found that experience accumulated with age may support a more growth-minded perception. This again was especially true for subject areas associated with explicit signs of progress.

A limitation of this study methodology is that it did not solicit the qualitative data that would help discern thinking that underlies participants' implicit theories. It would be beneficial to understand more about the individual differences involved and why certain abilities are understood to be less growth-oriented than others. In future research, open ended questions could be very revealing.

Additionally, the adapted items taken from the Dweck Mindset Instrument utilized only two items per ability type (one growth item and one fixed item). This was done so that a broad spectrum of abilities from different domains could be represented in the inventory; adding more items would have results in a lengthy survey that might have discouraged participation. However, future research looking to examine these unique growth mindset abilities might use a less limited set of items per ability type.

Past research has shown that if students are taught that academic progress is possible, they may work harder to overcome obstacles[7]. The present study builds on this by showing that creativity, cognitive, and interpersonal abilities can potentially also benefit from the introduction of interventions that specifically target the ability to grow.

This study found much variability across abilities in student perceptions. For example, it is theoretically possible for a child to score a 1 on math but a 6 on working memory. Thus, future interventions can apply this finding by building interventions that are narrowly focused on specific abilities.

The positive results surrounding interpersonal skills may also have implications. More testing in these areas is needed to determine definitively why students think they can change in these areas; however, just knowing that they believe they can opens new doors for research and classroom management. For example, if an instructor can work to improve the growth mindset of a student in relation to empathy, the student may improve the ability and have more positive peer relations.

Additionally, the findings of the present study are important because they show that all areas of ability and learning could be encouraged with a growth mindset-centered educational paradigm. Blackwell and colleagues found specific factors that aid in developing a growth mindset within a classroom[4] (e.g., praising hard work and effort, teaching about the malleability of the brain, encouraging risk taking over perfectionism). Such practices could be extended outside of the traditional classroom. For example, in music lessons a student taught how the mind develops with practice may be able to develop a growth mindset for the ability and thus continue through inevitable challenges.

It is important to emphasize that growth orientation will not always result in success. Students differ in many other learning-relevant variables such as interest or passion in different subject areas, which likely also correlate with outcomes. Nonetheless, growth mindsets are likely to reduce discrepancies according to developed cultural beliefs because they provide an even playing field of possibility for all students. Regardless of individual variables, students with growth mindsets will have a greater chance of success because they will perceive success as possible and dependent on practice and tenacity. Existing cultural stereotypes imply that students have innate "gifts," but working to improve the growth mindset of students in all areas of ability will benefit students from all demographics and learning backgrounds.

6. References

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