

## Article Conclusion

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On the terminology test, the statistically significant difference in achievement among students at the three cognitive levels suggests that the level of field-dependence has an impact on student achievement. Additionally, the lack of significant differences in achievement between students receiving the different treatments suggests that the difference in achievement was not likely a result of the treatment type. Similar results are reflected in the comprehension tests. The significant difference in achievement among the three cognitive styles again suggests that the level of field-dependence/field-independence has an impact on student achievement. Furthermore, the lack of a significant difference among color vs. black and white coding suggests that coding does not have a noteworthy impact on student achievement.

In further analysis of the results, notice that the difference between means is quite low when comparing the treatments. Along with the two-way tests of variance, this lack of a difference between means further supports the conclusion that coding has little impact on student achievement. However, the significant difference among the levels of field-dependence seems to indicate that cognitive style has an impact on student achievement. Furthermore, field-independent students were found to have higher levels of achievement than the other groups when exposed to black-and-white-coded instructional materials. In other words, field-independent learners were found to learn more effectively when exposed to black-and-white materials. The differences among the three field-dependence levels are statistically significant and likely have practical significance as well, because they provide still another dimension of learner characteristics that should be taken into account when designing and implementing instructional materials.

As with any study, it is critical to assess whether the results could have been caused by an extraneous variable or other explanation. While the fact that this particular study involved students in a basic educational psychology course could perhaps imply that the students have had limited prior exposure to the subject matter, it may be inappropriate to make this assumption. The lack of a pretest or other means of determining students' prior knowledge of the subject matter covered by the tests does not completely eliminate the possibility of prior exposure influencing the results. It is also unclear as to whether any prior learning experiences involved black-and-white or color-coded instructional content. Additionally, although students were assigned to randomly ordered groups, it is unclear as to whether they are relatively equal on other variables or whether other differences could impact the results. Additionally, it is not known whether different results would be attained by learners in a different setting or of a different age group. Although this study's title implies exploration of generalizability to *students* in a general sense, the study really only focuses on university students.

Perhaps future research should further investigate differences in achievement among field-dependent and field-independent learners. In particular, it may be helpful to further explore *why* significant differences existed in favor of field-independent learners when exposed only to black-and-white

instructional materials. Why do field-independent learners seem to learn better than other groups when exposed to black-and-white-coded content? Is it because color-coding can “get in the way”? Are there specific characteristics that lead to this effect and, if so, what are they? Perhaps these questions could be further molded into actual research questions to explore in more detail the differences between field-dependence and field-independence.