

Students' Learning Style Preferences and Teachers' Instructional Strategies: Correlations Between Matched Styles and Academic Achievement

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The purpose of the current study was to identify the extent to which learning styles influence the educational process as well as the outcome of elementary-age students in terms of academic achievement. This study examined potential relationships between the degree of match (as determined by comparing learning style preferences of students with instructional strategies of teachers) and the academic achievement of fourth grade students as shown by Palmetto Assessment of State Standards scores in the academic content areas of English language arts, mathematics, science, and social studies. The results of this study demonstrate a lack of significant correlation between variables.

Learning style theories have been cited as an effective means for helping teachers recognize the incredibly diverse needs students bring into the classroom (Felder & Brent, 2005; Hall & Mosely, 2005; Sternberg, Grigorenko, & Zhang, 2008; Williamson & Watson, 2007). According to Zapalska and Dabb (2002), an understanding of the way students learn improves the selection of teaching strategies best suited to student learning. In addition, these theories provide a framework that enables teachers to knowledgeably develop a variety of instructional methodologies to benefit all students (Williamson & Watson). This extends to those with special learning needs, and Guild (2001) even suggested some identified students might simply be exhibiting difficulties associated with a mismatch between teaching and learning styles.

Although there is a broad theoretical foundation for the existence of learning styles, the need remains for further research concerning the relationship between learning styles and

academic success (Cano-Garcia & Hughes, 2000; Romanelli, Bird, & Ryan, 2009). Indeed, significant debate still surrounds the issue of learning styles and its function in the instructional process (Sharp, Bowker, & Byrne, 2008). Particularly, researchers have not thoroughly explored the links between learning styles and achieved learning outcomes, thus hindering practical implementation of learning styles theory in instructional practice (Romanelli et al., 2009). Past research has predominately focused on identifying individuals' learning style preferences and patterns (Romanelli et al.). While this was purportedly beneficial for teachers in selecting and developing instructional practices, research along those lines often evaluated the implementation of specific learning or instructional style models (Lovelace, 2005; Noble, 2004). Additionally, the majority of studies pertaining to learning styles involved participants in secondary or post-secondary education (Sharp et al.); thus, the role learning styles may play in

the achievement of primary grade students needs further investigation.

It was essential, therefore, to conduct additional research identifying the extent to which learning styles influence the educational process as well as the outcome of students, particularly elementary-age students, in terms of academic achievement. Further, it was imperative that some of this research occur in authentic learning environments, and a collective view of learning styles integrating several dominant components of various theories could make the application of findings realistic and effective for use in the typical classroom. Thus, the purpose of the study was to examine student learning style preferences and teachers' instructional practices, exploring the extent to which these were matched in a typical classroom setting. The researcher then paired the observed degree of match with students' academic achievement to detect potential relationships. The study intended to answer the following question for each of the academic content areas of English language arts, mathematics, science, and social studies. Is there a significant relationship between the degree of match (as determined by comparing learning style preferences of students with instructional strategies of teachers) and the achievement of fourth grade students as shown by Palmetto Assessment of State Standards (PASS test) scores?

Methodology

Because of the identified need for empirical data concerning the influence of learning styles on academic achievement, a quantitative approach with a correlational research design was appropriate for the study. Three instruments, the CAPSOL® styles of learning inventory, an instructional strategy record sheet, and an accommodation checklist were utilized to collect and compile degree of match scores. Scores from the PASS test provided achievement data. The researcher used Pearson's product-moment correlation coefficient to analyze the data

statistically, and the significance level was set at $p < .05$

Participants

Participants for the study included students taken from a sample of 308 fourth grade students from thirteen classes in three school districts in northwestern South Carolina. Of those, 203 submitted the necessary consent forms. However, the researcher was only able to collect a complete set of data from 187 students. Missing data from some aspect of the study were unavailable for the other 16 approved students, resulting in their omission from data analysis. Of the 187 final participants, 94 were males and 93 were females, and they demonstrated a moderate amount of diversity with 133 Caucasians, 40 African Americans, and 14 of other descent. Only 22 of the participants had identification of any type of learning disability, as indicated by the presence of an Individualized Education Program (IEP) or 504 Plan.

Procedures

The researcher collected student achievement data for each participant from the schools as indicated on PASS test reports in the form of a scaled score in each academic content area, English language arts, mathematics, science, and social studies. In addition, participating students completed the CAPSOL® styles of learning inventory in the fourth term of the school year in which the study took place. The researcher collected the completed inventories and scored them, identifying student preference profiles indicating a high, moderate, or low preference for each of the nine learning style elements.

Using blank forms provided by the researcher, participating teachers recorded all instructional strategies utilized in a two-week period. The researcher collected the completed record sheets and compiled a list of all strategies incorporated throughout the study. Four education professionals

each used a checklist to pair the instructional strategies with one or more of the nine learning style elements identified with the CAPSOL® learning styles inventory. The researcher tabulated the results of this process, producing a final compilation checklist by matching instructional strategies with each learning style element so paired by at least three of the four raters. The researcher then utilized these pairings to complete a cumulative accommodation data sheet and indicate the number of times individual teachers accommodated each learning style element during the data-collection period of the study. This procedure led to an identification of high (9+), moderate (4-8), or low (0-3) accommodation for each learning style element in each of the four academic content areas included in the study.

Linking student learning style preference profiles with teachers' learning-style related instruction produced numerical degree of match scores for each learning style element in each content area. A complete match (e.g. high preference/high accommodation) received a score of zero, a complete mismatch (e.g. high preference/low accommodation) received a score of one, and a near match (e.g. high preference/moderate accommodation) received a score of one. The researcher compiled the scores for each learning style element to achieve a score indicating the degree of match between students' learning style preferences and teachers' instructional strategy accommodations. This pairwise comparison of indications produced a degree of match score ranging from zero to 18 for each student in each academic content area included in the study.

Results

English Language Arts (ELA)

Both the degree of match scores and PASS test scores followed the essential pattern of the normal curve and ranged from five to 14 and from 529 to 786, respectively. Mean scores were 9.68

for degree of match and 639.59 for the PASS test. However, a scatter plot of these two variables together revealed a rather random pattern of placement. Analysis with Pearson's Correlation Coefficient produced a correlation score of $r = .030$. The results of the analysis also failed to meet the limitations set for statistical significance with a score of $p = .684$. Therefore, the data were insufficient to reject the null hypothesis for the area of English language arts.

Mathematics

Mathematics content area data produced similar results. Degree of match scores ranged from six to 16 with a mean score of 9.87, while PASS test data indicated a minimum score of 546, a maximum of 859, and a mean score of 656.17. Although an acceptable representation of the normal curve was again present in both degree of match scores and PASS test scores, a combined scatter plot of the data produced a rather random display. Statistical analysis likewise indicated a correlation of $r = .013$ with a significance level of $p = .857$. This prevented the researcher from rejecting the null hypothesis in the area of mathematics.

Science

Data in the science content area revealed similar findings. The lowest degree of match score was two, the highest was 15, and the mean score was 9.57. On the science portion of the PASS test, students' scores ranged from 523 to 844, with a mean score of 646.61. Once again, these data presented a fairly normal distribution, and the scatter plot did not reveal a strong relationship between degree of match and achievement scores on the PASS test. The resulting correlation coefficient (r) was $.087$ with a significance level (p) of $.235$. Although these scores were the strongest of any analysis in the current study, they still failed to produce the necessary results to reject the null hypothesis concerning potential relationships in the science content area.

Social Studies

Fewer participants (171 of the total 203) were included in the social studies portion of the study, as students in two classes did not receive any social studies instruction during the data-collection period. Nevertheless, the results of the data analysis remained consistent with the rest of the study. The basic arrangement of the normal curve was evident in both degree of match and PASS test scores. The smallest degree of match score obtained was four, while the highest was 14, and the mean score was 9.67. The minimum score on the year-end test of social studies achievement was 550, the high was 834, and the mean was 659.98. The scatter plot evidenced a lack of a strong relationship between degree of match and academic achievement in the social studies content area. Statistical analysis using Pearson's correlation coefficient produced an r score of .045 with a p value of .562, indicating this result was not statistically significant. Hence, the evidence for a potential relationship between degree of match scores and students' academic achievement in the social studies content area was insufficient to reject the null hypothesis.

Discussion

Although these findings demonstrate weak, if any, correlation between students' academic achievement and degree of match in learning style preferences and accommodations, the lack of statistical significance requires the use of extreme caution when considering results of the current study. A serious concern in researching the field of learning styles is the issue of scientific control when conducting studies, and critics have asserted relevant research has generally lacked the necessary rigor or failed to produce solidly favorable results (Alaka, 2011; Bishka, 2010; Hall & Moseley, 2005; Pashler, McDaniel, Rohrer, & Bjork, 2009). Thus, the current study is not alone in failing to provide strong empirical evidence; however, this does not imply the findings of the

current study lack relevance or importance for the field of education.

The degree of match data demonstrated students' learning style preferences were not all equally compatible with teachers' instructional accommodations. It was obvious the elementary student participants held unique learning style preferences, which is consistent with the results of prior research (Alaka, 2011; Felder & Brent, 2005) and confirms the appropriateness of exploring this field for educational relevance. Further, teachers in the current study clearly favored certain modes of instruction over others, as accommodation levels were higher for visual and auditory instruction than for bodily-kinesthetic activities, and teachers assigned written expressive tasks more frequently than oral expressive. Thus, there were clear discrepancies between learning style preferences of students and strategies implemented by teachers in this study. Some learning style elements, such as visual and auditory, were fairly well matched at moderate to high preference between both students and teachers. Others, however, were in direct opposition as demonstrated by an overwhelming 97% of students indicating a moderate or high preference for the bodily-kinesthetic learning style while the majority of teachers (eight of 13) provided low accommodation for such activity and none provided high accommodation.

Considering academic achievement results also provided the researcher with valuable information as students in the same classroom experienced extremely different degrees of academic success. Receiving instruction from the same teachers, some students performed at highly proficient levels while others failed even to meet the basic requirements. The obvious concern is that many children were achieving below the compulsory standards and perhaps even farther below their true potential.

Implications

While the lack of empirical evidence found in this study was consistent with much prior research (Alaka, 2011; Bishka, 2010; Hall & Moseley, 2005; Pashler et al., 2009), the concept of learning styles still holds appeal for educators (Bishka; Martin, 2010; Scott, 2010). A potential benefit of incorporating learning styles research in the classroom is helping teachers and students alike develop greater awareness and understanding of characteristics unique to each individual in any given classroom (Alaka; Koçakoğlu, 2010; Lauria, 2010). Learning style assessments can help identify personal preferences as well as potential strengths and weaknesses in how learners deal with content and approach learning tasks (Hawk & Shah, 2007). However, students may be inaccurate in their responses to assessment items (Bishka), and teachers must be careful to avoid labeling students based on assessment results, as this would be counterproductive to a theory designed to encourage and support diversity (Scott, 2010). Instead, teachers should utilize assessment findings to assist them in broadening their methods to incorporate the variety of styles expressed by the students under their charge (Cox, 2008; Hawk & Shah; Koçakoğlu).

Even if teachers or schools choose not to administer assessments, teachers can still use an understanding of learning style characteristics to inform their instruction. Although research studies have been unable to consistently provide evidence that matching styles is beneficial to students' academic achievement, there are indications that this may be the case (Hsieh, Jang, Hwang, & Chen, 2011; Lauria, 2010). Further, the literature also supports the notion that teaching to a variety of learning styles may be even more beneficial than tailoring instruction to exactly match student preferences (Alaka, 2011; Martin, 2010). However, the overwhelming number of learning style theories, and the plethora of physiological preferences, psychological tendencies, and

personality traits can leave teachers bewildered (Alaka). The CAPSOL® styles of learning inventory includes a manageable number of important components from various learning style theories, making it a worthwhile tool to help teachers develop an awareness of learning styles concepts and assessment information. Teachers can then use such information to monitor their instruction and ensure they are utilizing a variety of strategies and selecting those most appropriately suited to particular lesson content (Koçakoğlu, 2010).

It is essential to return the focus to teaching students and helping them become successful learners. Teachers must be empowered to refine the art of instruction, trusted to develop and use their skill and intuition, and encouraged to implement strategies that meet the children's needs (Martin, 2010). It is essential to return the spotlight to the students rather than content standards and proficiency scores. Obviously, it is necessary to maintain measures of accountability and uphold high standards, but the education system must not do this at the expense of teaching for student learning. An awareness of learning style preferences and the ability and willingness to differentiate instruction by incorporating a variety of teaching style approaches suited to such preferences can help teachers make great strides in reaching and meeting the educational needs of all their students (Cox, 2008; Hawk & Shah, 2007; Hsieh et al., 2011; Lauria, 2010).

Limitations

Despite the effort to conduct careful research, the use of authentic settings and procedures inhibited the researcher's control over the variables in the study and produced serious limitations affecting the outcome. The use of convenience sampling limited the ability to generalize the findings of this study to those schools with equivalent demographics and similar class structure and design as well as students with like characteristics and use of the

same instruments and comparable instructional strategies. Another threat to internal validity existed in the researcher-made and self-report nature of the instrumentation utilized to gather data concerning teachers' instructional strategies. Because the study took place in the final quarter of the school year, it was impossible for the researcher to request refinement and clarification from all teachers, and some teachers stated their recorded strategies were not entirely typical for the year. Further, group planning and inconsistency in recording may have compromised the accuracy of teachers' instructional strategy data. Some teachers simply reported the plan developed by their grade-level team of content area teachers, and some teachers were much more explicit in their reporting than others. This discrepancy as well as lack of clarity and insufficient information for particular descriptions could account for variations and inaccuracies in teachers' accommodation data and contributed to measurement error, therefore, affecting the achieved degree of match scores.

In addition, students with disabilities or low reading levels may not have correctly decoded and responded to the learning styles inventory and/or year-end achievement test, possibly providing inaccurate assessment of these variables. Likewise, the accommodation checklist may not have given an accurate measure of the true instructional strategies provided by teachers. Due to the researchers' inability to secure experts in the field of learning styles research, the education professionals called upon by the researcher to complete the accommodation checklist were limited in their understanding and experience with the topic although they do all hold a terminal degree in education.

Finally, the learning style elements included in the study present varying levels of difficulty in identifying them based on brief written descriptions of classroom activities. Some elements, such as written expressive, appeared straightforward and easy to identify, while others

had much more discrepancy between the raters. The bodily-kinesthetic element was perhaps misleading as activities that involved movement necessitated categorization as such although the actual activity may have had no relationship to the actual learning process. The sequential and global elements also proved particularly challenging to identify based on short descriptions of discrete instructional activities. Because only those strategies identified by three of the four raters were included, the final checklist rating 200 instructional episodes included zero accommodations for the global element and only 13 for the sequential element. This necessarily influenced the degree of match scores and, therefore, the final correlations. However, it is illogical to think the teachers did not utilize either of these strategies throughout their instruction, but rather one must ascribe the limitation to the process of recording and categorizing the data.

Recommendations for Future Research

While the limitations of the current study influenced the results, they also provided important insight into both the content and procedural issues requiring consideration in further research. Future investigations must devise a more consistent and thorough method of collecting and categorizing instructional data, perhaps involving the researcher as an observer rather than relying on teachers' self-reporting. This would require a more intrusive presence in the classroom and would demand a considerable investment of the researcher's time and resources; however, it would provide a greatly enhanced view of the instructional approach of the teachers and yield much more uniform data for analysis. Enlisting seasoned experts in the field of learning styles to review and categorize the instructional strategies would also help to ensure the accuracy of the accommodation data and, therefore, the degree of match scores as well.

Future explorations could investigate the possibility that students' learning style

preferences may change as they mature or in various subject areas (Glenn, 2009; Hall & Moseley, 2005). Factors influencing teachers' instructional practices could also be the focus of future inquiry, providing insight in the role of such things as personal knowledge and experience, time constraints, convenience, and subject matter. Researchers also could explore the implications of limited methodological and material resources and their effect on teachers' selection and planning of instructional episodes. Other recommendations for future research include both quantitative and qualitative studies as well as longitudinal studies and additional analyses conducted with various subgroups of students. Researchers may seek to investigate the influence of gender and cultural variables on both learning style preferences and academic achievement. In addition, studies examining the role of learning style preferences for students with and without identified learning needs could provide valuable insight for educators.

Conclusion

While the current study did not provide support for the existence of relationships, it also did not negate the possibility that such relationships may exist. It did clearly show further studies need to protect carefully against the design and data flaws exposed in this study. Such flaws rendered unsuccessful the attempt to bridge the gap effectively between theory and practice in terms of how learning style preferences and academic achievement are related. Therefore, the current study left unanswered questions about the practical application of learning style theory (Cano-Garcia & Hughes, 2000; Romanelli et al., 2009; Sharp et al., 2008) and whether potential results are worth broad scale investment (Evans & Waring, 2006; Kratzig & Arbutnott, 2006; Pashler et al., 2009). However, the revealed limitations and the lack of definitive findings actually expose the need for further research to delve into the complexities of how students learn and teachers provide instruction.

At the very least, the findings of the current study substantiate the existence of differences in learning and teaching styles and clarify some important ways in which one can evaluate these processes. Due to its straightforward design and its ability to produce acceptably reliable results (CAPSOL® Styles of Learning, n.d.; Nunnally, 1978), the CAPSOL® styles of learning inventory was a useful tool for assessing learning style preferences and could easily provide teachers with informative data concerning their students' as well as their own preferred learning modes. Such awareness could prompt attention to the methods of instructional delivery utilized in the classroom as teachers begin to think about how their instruction may or may not meet the needs of the students under their tutelage.

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