CHARTING SUCCESS:
Data Use and Student Achievement in Urban Schools

EXECUTIVE SUMMARY

Council of the Great City Schools
Summer 2012

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Overview

In recent years, interest has spiked in data-driven decision making in education—that is, using various types of student data to inform decisions in schools and classrooms. The increased emphasis on data use is based on the belief that student data can be an important lever for improved teaching and learning. Specifically, the more information educators have about students, the better they will be able to understand and address students' academic strengths and needs. As a result, many schools, school districts, and states have invested in resources and tools designed to provide teachers, principals, and other key stakeholders with access to student data throughout the school year.

In October 2008, the Council of the Great City Schools and American Institutes for Research (AIR) launched a project funded by The Bill & Melinda Gates Foundation that focused on understanding the use of data as a lever for instructional improvement. This study focused specifically on interim (also known as benchmark) assessments that are often adopted at the district level. Interim assessments are typically characterized as falling between regular (often daily) formative assessments and annual summative assessments. They are administered systematically at regular intervals (e.g., every six to eight weeks) throughout the school year in order to gather information about students' knowledge and skills. Interim assessments are described as serving several purposes, including predicting student performance on end-of-year state tests, diagnosing student strengths and weaknesses on topics taught during a specific time frame, and providing data that can be used to evaluate a curriculum or instructional program.

The goals of this project were to (1) document and understand current interim assessment data-use practices in urban school districts and (2) to test the links between data-use practices and perceptions and student achievement. This brief is a summary of the report that focused on the second objective: examining the empirical relationships between teacher- and school-level data use and student achievement in mathematics and reading. By examining the extent to which certain data-use practices are related to student achievement, the study expands on the existing body of literature on the use of interim assessments to drive instructional improvement. The full report*, Charting Success: Data Use and Student Achievement in Urban Schools* can be found at www.cgcs.org, along with its companion pieces *Using Data to Improve Instruction in the Great City Schools: Documenting Current Practices,* and *Using Data to Improve Instruction in the Great City Schools: Key Dimensions of Practice.*

Key Dimensions of Data Use

To guide the study, we formulated a theory of action that hypothesized how data practices at multiple levels (district, school, principal, teacher, and student) may be related to each other and ultimately to improved student achievement. We began by acknowledging that interim assessment data may be used for three general purposes:

- To better understand the academic needs of individual students and respond to these needs by targeting instruction, support, and resources accordingly.

- To better understand the instructional strengths and weaknesses of individual teachers and use this information to focus professional development, peer support, and improvement efforts.

- To support and facilitate conversations among teachers and instructional leaders regarding strategies for improving instruction.

These practices, in turn, are thought to lead to improved and more responsive teaching and therefore yield increased student achievement.

At the outset, we identified four key dimensions of interim assessment data use—*Context, Supports for Data Use, Working with Data,* and *Instructional Responses*. This proposed theory of action is shown in Exhibit 1. The diagram flows from left to right, with key dimensions on the left leading, in theory, to key dimensions to the right.

In brief, the context factors at the far left are hypothesized to lead to the establishment of supports for data use, which in turn are expected to facilitate teachers and principals working with data. Working with data hypothetically leads to a change in teaching strategies or instructional responses, which ultimately leads to improved student achievement. Barriers to using data are represented with one bar below the key dimensions with dashed arrows signifying that real or perceived barriers can interrupt data use at any point in the process.

Exhibit 1. Using Data from Interim Assessments to Improve Student Achievement
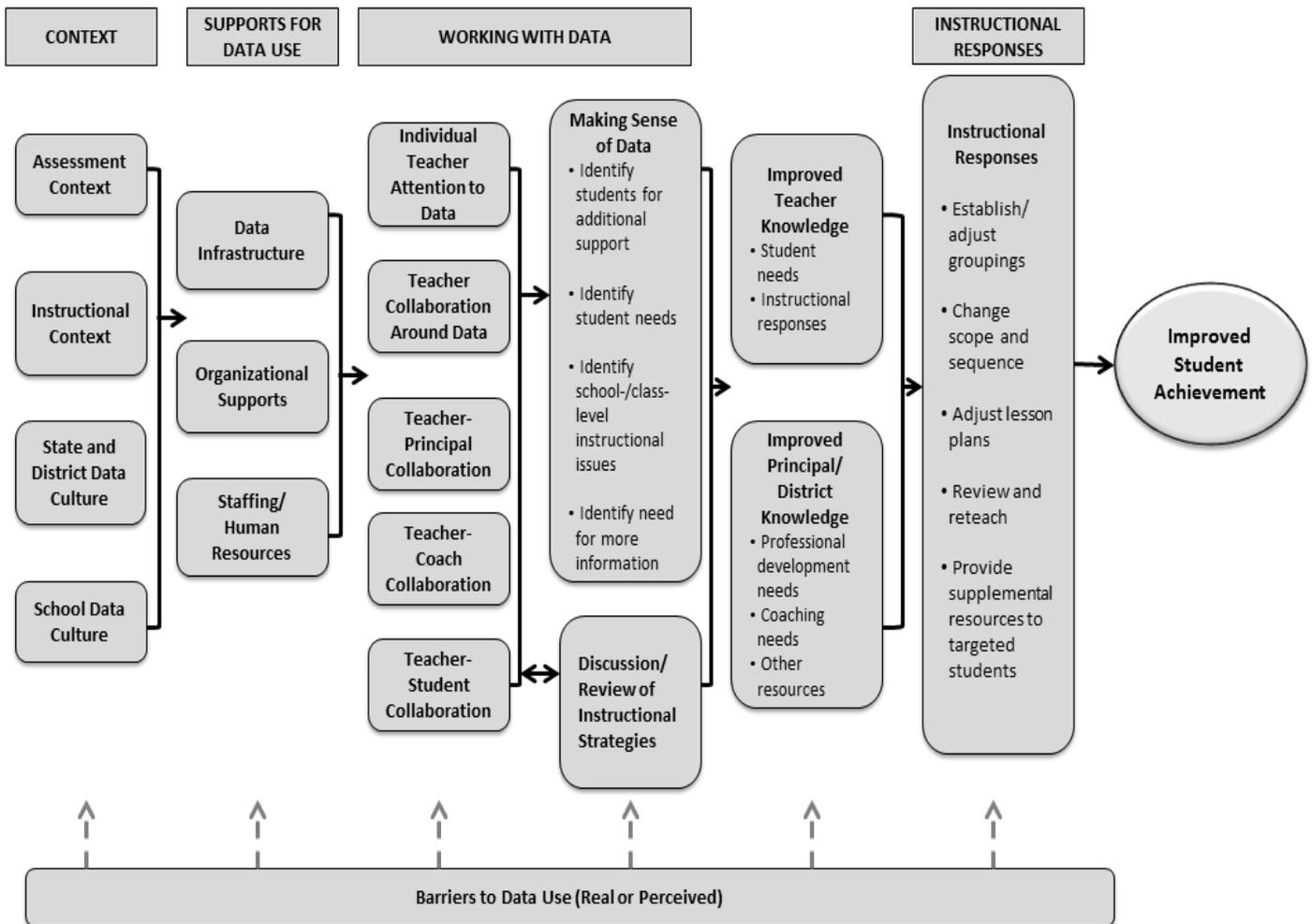
These concepts in the theory of action are composed of a number of practices and perceptions related to data use at all levels of the education system. For the empirical study linking the key dimensions with student achievement, we focused on classroom-level data-use practices and perceptions by surveying teachers, and we focused on school-level data-use practices and perceptions by surveying principals.

Key Dimension 1: Context

The first key dimension broadly encompasses the various contextual and cultural factors that may be related to data use. Key elements of *Context* include the assessment context, the instructional context, the state and district data culture, and the school data culture. Although other contextual elements are theoretically relevant (e.g., the political or the economic context), our theory and measurement of data use focused on factors that we hypothesized are most relevant to the use of data in school districts, schools, and classrooms.

Key Dimension 2: Supports for Data Use

This dimension involves the specific elements of practice related to logistical and operational support for using data, including the data infrastructure, organizational supports, time allocation, and staffing and human resources necessary to support using interim assessment data to guide and improve instruction.

Key Dimension 3: Working with Data

This dimension focuses on the ways that teachers and principals work individually and together to understand student data, including individual teacher attention to data, collaboration around data, and making sense of data, which refers to specific ways of reviewing assessment data to understand student performance.

Improved Knowledge. Implicit in the path from making sense of data to responding in the classroom is a change in educators' knowledge about student needs and principal and district knowledge about teacher and school needs.

Important aspects of **Improved Teacher Knowledge** include improved awareness and understanding of the following:

- Instructional needs and challenges of individual students
- Instructional needs and challenges facing their classrooms as a whole
- Teachers' own strengths and weaknesses
- Strategies and resources for addressing the needs of struggling students
- Strategies for teaching and re-teaching specific concepts in different ways

Important aspects of **Improved Principal and District Knowledge** include improved awareness and understanding of the following:

- Instructional needs and challenges facing individual classrooms or teachers and the school as a whole
- Teachers' (and schools') strengths and weaknesses
- Strategies and resources for addressing the needs of teachers and schools

Although we identify teacher and principal knowledge explicitly in the theory of action, measuring their knowledge was beyond the scope of this study.

Key Dimension 4: Instructional Responses

Instructional Responses are the ways that schools and teachers translate the improved knowledge they glean from reviewing interim assessment results and use it to change classroom-level instruction. This dimension also includes actions (e.g., interventions, professional development) implemented at the school and district levels in response to patterns and trends in student assessment data.

Barriers to Data Use

As shown in Exhibit 1, perceived *Barriers to Data Use* associated with any of the aforementioned key dimensions may disrupt the theoretical progression toward improved student achievement. The most common *Barriers* identified in previous research include a lack of time to engage in data exploration and reflection, poor assessment quality or validity, lack of data accuracy, lack of alignment with standards and pacing, lack of timeliness and accessibility of data, limited staff capacity, and negative perceptions of the use of interim assessment data for teacher evaluation.

Research Design

The overarching goal of the study was to understand the links between practices and perceptions related to using interim assessment data and student achievement. Our analysis focused on the relationships between the four key dimensions of data use and student achievement on state assessments in reading and mathematics. We also examined the links between perceived *Barriers to Data Use* and student achievement in both subjects. The analyses were conducted using a multi-level framework, meaning that we examined relationships among the data-use practices at both the school and classroom levels. This study was designed to address two broad research questions about using student data from interim assessments.

Research Questions

1. What are the relationships between teachers' data-use practices and perceptions and their students' achievement?

2. What are the relationships between school policies, practices, and resources for data-driven instruction and student achievement?

To test the hypothesized links in the theory of action, we measured teachers' and principals' data-use practices and perceptions using surveys administered at three points during the 2009–10 school year. The surveys measured the key dimensions of data use among 1,581 teachers and 212 principals in a sample of 193 randomly selected elementary and middle schools in four geographically varied urban districts.[1] The analyses examined the links between the key dimensions and student achievement on state assessments in mathematics and reading. Test scores for 61,798 students were used in the analysis, and each student was linked to the principal and teachers responsible for their instruction. A detailed description of the methodology is included in the main report.

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[1] See *Charting Success: Data Use and Student Achievement in Urban Schools*, pgs. 83-84, for more information on the number of participating principals, teachers, and students.

Key Findings

Descriptive Statistics

In general, scores on the key dimensions were higher in the elementary grades than in the middle grades.

- **Elementary grades reading teachers** reported more positive perceptions about using data and higher levels of data-use practices than **middle grades reading teachers**, with significant differences found in three of the four key dimensions—*Context, Supports for Data Use,* and *Working with Data*. However, there were no significant differences in *Instructional Responses* or *Barriers to Data Use*.

- **Elementary grades mathematics teachers** also reported higher levels of data-use practices than **middle grades mathematics teachers**, with significant differences found for both *Working with Data* and *Instructional Responses*. There were no significant differences among elementary and middle grades mathematics teachers on *Context, Supports for Data Use*, or *Barriers*.

There were similar differences between elementary and middle grades principals.

- **Elementary grades principals** had higher scores than **middle grades principals** on *Context* and *Supports for Data Use* when reporting on both reading and mathematics. Elementary grades principals also reported significantly fewer *Barriers* to using data in both subjects than did middle grades principals.

The finding that data-use perceptions and practices were higher among educators in the elementary grades than those in the middle grades may be due in part to the fact that elementary grades teachers often teach all subjects, have fewer students in total, and interact with their students for more time during the school day than do middle grades teachers. This may promote a more supportive data culture in which teachers and administrators are more likely to work with the data and engage in data-driven decision making. More support may be necessary to facilitate higher levels of data use in middle grades in urban districts.

In addition to observing descriptive patterns for the key dimensions, we also examined correlations among the data-use scales as measured by our surveys. As expected, the four key dimensions—*Context, Supports for Data Use*, *Working with Data*, and *Instructional Responses*—all were positively correlated for both teachers and principals in each grade level and subject. These scales were negatively correlated with *Barriers*, also expected.

Teachers' General Data Use and Student Achievement

We used multilevel structural equation modeling (SEM) to examine relationships between teachers' general data use and student achievement in each grade level and subject area. First we created a latent variable of *General Data Use* by statistically combining the scale scores for each of the four key dimensions (*Context, Supports, Working with Data*, and *Instructional Responses*).[2] Next we tested the path between teachers' *General Data Use* and student achievement.

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[2]Although observed variables are directly measured (such as with a survey, observation, or interview), latent variables represent underlying constructs that are measured using multiple observed variables. For example, a latent variable of socioeconomic status may be made up of the observed variables of education, income, and professional status. In this case, we created one latent variable of "General Data Use" with the observed variables of *Context, Supports for Data Use, Working with Data*, and *Instructional Responses*.

The results indicate that teachers' general data-use practices and perceptions are positively related to student achievement in elementary grades reading and middle grades mathematics. That is, teachers with higher levels of *General Data Use* (and perceptions of data supports) have students with higher state assessment scores in middle grades mathematics and elementary grades reading. The magnitude of this relationship was modest, with effect sizes of 0.10 for middle grades mathematics and 0.17 for elementary reading. Yet shifting a student's test score by 0.17 standard deviations could have a significant effect on his or her academic standing. For example, if a student who was at the 50th percentile at the end of Grade 3 had a fourth-grade teacher who was at the mean on *General Data Use*, that student would be at the 57th percentile at the end of Grade 4. This could be the difference between a student being categorized as below proficient and proficient on a state assessment. Also, if a student were in classrooms for multiple consecutive years with teachers who have strong data-use perceptions and practices, this positive advantage could be cumulative over time.

There was no statistically significant relationship between teacher data use and student achievement in elementary grades mathematics or middle grades reading. These findings in combination partially support the theory of action.

Links between Individual Dimensions of Teacher Data Use and Student Achievement

We used Hierarchical Linear Modeling (HLM) analyses to examine the relationship between each key dimension and student achievement. For these analyses, we examined—separately—*Context, Supports for Data Use, Barriers,* and a variable named *Attention to Data in the Classroom*, which was a combination of *Working with Data* and *Instructional Responses*.[3] Each analysis controlled for background characteristics of the students, teachers, and schools, including prior achievement. Results indicate that some of the teacher data-use dimensions were significantly related to student achievement.

Specifically, in middle grades mathematics and elementary grades reading, *Attention to Data in the Classroom* was significantly and positively related to student achievement, such that the more teachers reported reviewing interim assessment data and responding instructionally, the higher their students' achievement on the state test. There was also a significant negative relationship between *Barriers to Data Use* and student achievement in elementary mathematics.

Principals' General Data Use and Student Achievement

To address the question about school-level data use, we examined links between principals' data-use practices and perceptions and achievement for students in their schools. As with the teacher-level analyses, we used SEM to create a latent measure of principals' *General Data Use* and examine relationships between it and student achievement in each grade level and subject area.

Results indicate that principals' *General Data Use* was positively related to student achievement, but only in middle grades mathematics. The link between *General Data Use* and student achievement was not statistically significant in elementary mathematics, elementary reading, or middle grades reading.

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[3]The scales *Working with Data* and *Instructional Responses* were particularly strongly related, with correlation coefficients greater than $r = 0.75$ for the teacher samples and 0.80 for the principal samples. This observation led us to consider whether these aspects of data use—defined as distinct in the theory of action (Exhibit 1)—are, in fact, too similar to separate, at least as measured by the survey instrument we used. As a result, we combined *Working with Data* and *Instructional Responses* for some of the analyses.

Links between Each Key Dimension of Principal Data Use and Student Achievement

We used HLM analyses to examine the relationship between each key dimension at the school (principal) level and student achievement. For these analyses, we examined—separately—*Context, Supports for Data Use, Barriers,* and a variable named *Attention to Data in the School*, which was a combination of *Working with Data* and *Instructional Responses* for principals. As with the teacher analyses, each of these analyses controlled for a number of background student-, teacher-, and school-level characteristics, including prior achievement at the school and student levels.

Results indicate that principal perceptions of *Supports for Data Use* were positively related to student achievement in elementary mathematics and reading, and their *Attention to Data in the School* was positively related to student achievement in elementary mathematics.

No other dimensions of principal data use, including *Context* and *Barriers to Data Use*, were significantly related to student achievement.

Discussion

Although there was some prior evidence that using periodic assessments (formative assessments, progress monitoring, and curriculum-based measurement) may be positively related to student achievement, research on interim assessment use is limited. At the same time, significant investment has been made in interim assessment systems in school districts across the country. There is a great need for information about whether and how general and specific aspects of teachers' and principals' data-use practices and perceptions are linked to student achievement. This study attempted to fill this gap by measuring multiple aspects of interim assessment data use among teachers and principals, and empirically testing the links between key data-use practices and student achievement on end-of-year state assessments.

Summary of Findings

We hypothesized that general and specific data-use practices and perceptions would be positively related to student achievement. The findings partially supported this hypothesis. For both teachers and principals, *General Data Use* was related to student achievement in some grade levels and subjects. As for more specific practices and perceptions, teachers' *Attention to Data in the Classroom,* principals' *Attention to Data in the School* and principals' perceptions of *Supports for Data Use* were related to higher student achievement. In other words, the more that teachers and principals reported reviewing and analyzing student data and using this information to make instructional decisions, the higher their students' achievement, at least in some grades and subjects. Moreover, for principals, the more they reported having support in the form of data infrastructure, adequate time for review and discussion of data, professional development, and the appropriate human resources, the higher their students' achievement. Again, these results varied by grade and content area, with significant links observed in both elementary grades and middle grades, as well as in mathematics and reading.

Study Limitations

This study used rigorous statistical modeling to explore the relationships between the key dimensions of data use and student achievement, but it is important to note some limitations. The school-based samples of principals, teachers, and students were sufficiently large in size, but there were only four districts, which may limit the generalizability of the findings. In addition, the study relied on self-report survey data rather than observations of actual data use and instructional practices.

Moreover, the study was not designed to provide information about the implementation quality of the interim assessment process in the participating districts, nor does it provide information about the quality of the actual interim assessments used. It also does not identify whether certain practices within the key dimensions of data use are more promising than others. Future work should continue to refine the measurement strategy to allow for analyses of the links between more specific data-use practices and student achievement than could be tested in this foundational study.

Finally, although this study provides evidence of a relationship between some key dimensions of data use and student achievement, it is essential to understand that no causal claims about the nature of these relationships can be made on the basis of this correlational study. Interim assessments and the use of their data are just one of a number of policies, practices, and interventions being implemented within schools and school districts. It is not our claim that supports for data use and attention to data use in the classroom or school directly cause improved student achievement in certain grades and subjects. Rather, this study provides foundational evidence that as some aspects of data use increase, so too does student achievement.

Future Directions

Future research can help provide additional evidence of whether and how interim assessments can be used as a tool to increase student achievement. The ultimate goal would be to develop a set of standards or strategies that districts and schools can use as a guide for effective data use.

Self-report measures of data use have provided valuable information on how interim assessments are used at classroom and school levels in the selected urban districts. As already noted, these data could be further enhanced through observations of actual data-use practices. These could include observations of data meetings where staff discuss the results of interim assessments or plan instructional responses and professional development on data use. Deeper study could also include an examination of lesson plans that stem from a review of the interim assessment data, along with classroom observations to explore how these plans are implemented.

As we learn more about specific data-use practices that are associated with student achievement, another next step is to develop a more refined theory of action. This could involve developing specific data-use interventions intended to improve data use and instructional responses. Further research can also test the impact of such interventions on student achievement and identify the key mechanisms through which data use affects student learning.

Of the six significant relationships between data-use practices/perceptions and student achievement that emerged in this study's analyses, five were found in the elementary grades. This finding suggests that something about the structure of the elementary grades may be more conducive to the successful use of interim assessments, compared with the middle grades.

Further research is needed to identify key factors in the elementary grades that could be adopted or adapted in the middle grades to potentially increase the utility of interim assessments for older students. Similarly, further exploration can help achieve a better understanding of the data-use differences in mathematics and reading that were revealed in this study.

Conclusions

This study sought to begin to understand the connection between different aspects of interim assessment data use and student achievement. Given that school districts and schools are facing significant budget challenges and must make important decisions about resource allocation, it is imperative that we identify the specific dimensions of data use that are most important for improving student outcomes. Many school districts are increasingly using various types of assessments and data in an effort to engage in data-driven decision making. Although the study focused primarily on the use of data from interim assessments, some of the study results may extend beyond interim assessments to provide a glimpse into the overall data culture of participating districts. As such, this study provides a foundation for future exploration of the relationships between student achievement and other types of data that can be used for instructional and school improvement.

Finally, these findings have implications for data-use policies and practices in school districts and schools. This is particularly important as the nation moves toward the Common Core State Standards and the assessment systems that will accompany them. The findings suggest that, at the very least, if schools adopt interim assessments to produce changes in student achievement, schools and districts should provide adequate support for using the data, and teachers should actively use data in the classroom—both by spending time individually and collaboratively reviewing the student data and by responding instructionally. Although these findings do not identify the specific aspects of each dimension that are most important, it appears that data use by principals, particularly in elementary school, may be as important as teacher data use. This is in line with the findings from our site visits (as well as prevailing wisdom) that suggest that leadership and support from the administration are critical. The findings of this three-year project revealed that schools are better able to work with data when they have the appropriate data infrastructure, organizational supports for the analysis and productive discussions about data, human resources (e.g., data coaches), and professional development. In addition, there are important uses for interim assessment data by stakeholders at all levels. These include use by district leaders to identify professional development needs and evaluate district initiatives, use by school leaders to develop and evaluate school and staff improvement plans, and perhaps most importantly, use by teachers to inform instructional strategies. It is there in the classroom that students' needs are most effectively met.

About the Council of the Great City Schools

The Council of the Great City Schools is a coalition of 67 of the nation's largest urban public school systems. The organization's Board of Directors is composed of the Superintendent, CEO or Chancellor of Schools, and one School Board member from each member city. An Executive Committee of 24 individuals, equally divided in number between Superintendents and School Board members, provides regular oversight of the 501 (c)(3) organization. The composition of the organization makes it the only independent national group representing the governing and administrative leadership of urban education and the only association whose sole purpose revolves around urban schooling.

The mission of the Council is to advocate for urban public education and assist its members in their improvement and reform. The Council provides services to its members in the areas of legislation, research, communication, curriculum and instruction, and management. The group convenes two major conferences each year; conducts studies of urban school conditions and trends; and operates ongoing networks of senior school district managers with responsibilities for areas such as federal programs, operations finance, personnel, communications, research and technology. Finally, the organization informs the nation's policymakers, the media, and the public of the successes and challenges of schools in the nation's Great Cities. Urban school leaders from across the country use the organization as a source of information and an umbrella for their joint activities and concerns. The Council was founded in 1956 and incorporated in 1961, and has its headquarters in Washington, D.C.

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