What We Know About COLLABORATION

Part of the 4Cs Research Series

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ABOUT THE PARTNERSHIP FOR 21ST CENTURY LEARNING

P21, the Partnership for 21st Century Learning, recognizes that all learners need educational experiences in school and beyond, from cradle to career, to build knowledge and skills for success in a globally and digitally interconnected world. Representing over 5 million members of the global workforce, P21 unites business, government and education leaders from the U.S. and abroad to advance evidence-based education policy and practice and to make innovative teaching and learning a reality for every child.

ABOUT THE RESEARCH SERIES

P21, in collaboration with its research partners, produced a series of research briefs and annotated bibliographies on key aspects of conceptualizing, developing, and assessing the 4Cs.

The research briefs in this series start with an overview of key conceptual issues related to the 4Cs of Creativity, Critical Thinking, Collaboration, and Communication, review research on interventions designed to increase student proficiency within each of the 4Cs, describe recent work on how to assess on the 4Cs, and conclude with major take-away points from the available research.

The series is edited by Helen Soulé, Executive Director at P21, and Jonathan Plucker, Neag Endowed Professor of Education at the University of Connecticut.

The 4Cs Research Series is dedicated to Dr. Ronald Thorpe, president and CEO of the National Board for Professional Teaching Standards. A friend and visionary we lost too early.

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INTRODUCTION

Collaboration is increasingly mentioned as an important educational outcome, and most models of 21st century skills include collaboration as a key skill (e.g., Fadel & Trilling, 2012; Trilling & Fadel, 2009; Wagner, 2008, 2010). The P21 Framework for 21st Century Learning (www.P21.org/Framework) includes Collaboration as one of the 4Cs, along with Creativity, Critical Thinking, and Communication.

As Dede (2010) has observed:

> [T]he nature of collaboration is shifting to a more sophisticated skillset. In addition to collaborating face-to-face with colleagues across a conference table, 21st century workers increasingly accomplish tasks through mediated interactions with peers halfway across the world whom they may never meet face-to-face.…[C]ollaboration is worthy of inclusion as a 21st century skill because the importance of cooperative interpersonal capabilities is higher and the skills involved are more sophisticated than in the prior industrial era. (p. 2)

But what do we know about collaboration and collaborative learning? The value of collaboration, at all levels of formal education from primary grades to the university, has been assumed for many years, but until recently, policy makers have not singled out the ability to collaborate as an important outcome in its own right. Now, educators are turning to initiatives like the P21 4Cs work and the Common Core State Standards to highlight the importance of the specific teaching of collaboration, the associated sub-skills, and the environmental and situational aspects that help optimize collaboration. Collaboration is not merely a means to an end, but crucial to enhance.

Increasingly over the past two decades, we have seen organizations move to greater emphasis on new structures that encourage and facilitate team-based work. These structures are becoming dependent on networks of cross-functional teams and technology-related or technology-inclusive job descriptions (Stuart & Dahm, 1999). The nature of how work is now being accomplished has required a workforce of flexible and collaborative learners with complex cognitive skills (American Management Association, 2010).

However, Dede (2009) also notes that in the traditional American K-12 curriculum, "little time is spent on building capabilities in group interpretation, negotiation of shared meaning, and co-construction of problem resolutions" (p. 3). The ability to work effectively and efficiently with others has become a critically important skill for career and life success. Nevertheless, the emphasis on collaboration in our schools remains largely traditional, reflecting older models of interaction. As with other 21st century skills, we can no longer assume that collaborative competence is something that our students will learn "on their own." In this brief, we will discuss current conceptual approaches to collaboration, research on interventions, and promising assessment strategies.

DEFINITIONS AND MODELS

In a widely-used definition, Roshelle and Teasley (1995) describe collaboration as, "coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem" (p. 70). Similarly, Hesse, Care, Buder, Sassenberg, & Griffin et al. (2015) define collaboration as "the activity of working together towards a common goal" (p. 38). Given the existence of a largely common definition among scholars, the diverse theoretical approaches to studying collaboration are somewhat surprising.

Kuhn (2015), in a thorough review of research, provides a helpful classification of research on collaboration in education settings and proposes two broad categories. In the first category, which Kuhn describes as "the longer standing view" (p. 46), collaboration is viewed as a process leading to other desired individual and group outcomes, such as successful problem solving and enhanced intellectual development. Definitions, theories, and research from this perspective tend to investigate how working in teams of various sizes helps individuals achieve certain cognitive outcomes.

Dillenbourg, Baker, Blaye, & O'Malley et al. (1995) describe three distinct conceptual approaches within this paradigm: First, the social constructivist approach, stemming from the Piaget's work, views collaboration as a catalyst for individual students' cognitive development (Chi & Wylie, 2014; Ernest, 1998; Handal, 2003; Hickey, 1997). Second, the socio-cultural approach, inspired by Vygotsky, that sees social interaction as a transaction in which the interactions become internalized as the individual learns (Rogoff, 1991; Wegerif, Mercer, & Daweset al., 1999; Wertsch, del Río, & Alvarez, et al., 1995). A good example of this concept is Vygotsky's (1978) Zone of Proximal Development, which represents the gap between what an individual student can learn on their own versus the level of learning if they were to work under the guidance of an adult or group of peers. Third, is the shared cognition (or interactionist) approach, which emphasizes that social interactions are inseparable from individual student's thoughts and actions (Plucker & Barab, 2005; Resnick, Levine, &

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In 2014, Wheeling High School, located in Wheeling, IL, adopted the INCubatoredu program for entrepreneurship instruction. The program combines inquiry-based learning, student-centered learning, authentic learning experiences, and industry coaching and mentorship to provide students a unique collaborative, entrepreneurial experience. One of the main levels of distinction of the program is the use of the Lean Startup model, a foundational business model prevalent among multiple areas of operation and industries.

Students collaborate by working in teams and learn by identifying problems and proposed solutions. Through intensive instruction of the Business Model Canvas, students set out to create business opportunities by identifying such areas as customer segments and relationships, communication channels, revenue streams, cost structure, and unique value propositions. Using the Business Model Canvas, students work collaboratively toward creating a Minimum Viable Product, a version of a product or service that allows the team to measure customer feedback and collect valuable data on the effectiveness of their proposed solution. This inquiry-based research allows students to best understand what proposed solution the market demands. This focus is critical, as the business focus becomes about customer segments rather than the product or service itself. Students quickly learn the ability to adapt and are encouraged to "pivot," or change their business ideas to what the data tells them customer segments demand. Through their collaborative efforts, the students are able to fine tune their products, gather data based on their minimum viable product, and redesign as necessary.

In addition to the inquiry-based learning experience, students are able to learn business concepts from industry experts. Throughout the year, Wheeling High School welcomed 20 area businesspeople to guest teach the Entrepreneurship class, providing authentic business expertise in specific areas. Their interactive presentations and discussion allowed students to learn how business ideas are actually put into practice and gave them a glimpse into the job demands of a business professional. Each collaborative student group was also paired with a mentor to help guide decision-making as business ideas and Minimum Viable Products evolved.

During the 2014-2015 school year, nine student groups participated in the INCubatoredu program at Wheeling High School. Not only did students prepare for entrepreneurial and business careers, they refined important 21st century skills that will suit them well in any profession: adaptability, collaboration, critical thinking, creativity, and problem solving.

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Teasley et al., 1991; Thompson & Fine, 1999; Van den Bossche et al., Gijselaers, Segers, Woltjer, & Kirschner, 2011). Each of these perspectives has their own theoretical and research approaches and traditions.

Kuhn's second category includes conceptualizations of collaboration as a 21st century skill, with the implication that collaboration is a valuable educational outcome in and of itself. This approach includes the P21 Framework's definition of collaboration, which emphasizes (a) demonstrating the ability to work effectively and respectfully with diverse teams; (b) exercising flexibility and the willingness to be helpful in making necessary compromises to accomplish a common goal; (c) assuming shared responsibility for collaborative work; and (d) valuing the individual contributions made by each team member.

Included in this second category is Johnson and Johnson's (1994) seminal work on collaborative learning. They identify three types of learning behaviors: competitive, individualistic, and cooperative. They define cooperative learning as group work during which students have "a vested interest in each other's learning as well as their own" (p. 31). They saw most student work in school as largely competitive or, to a lesser extent, individualistic, yet they noted that all three behaviors are necessary for student learning (Johnson & Johnson, 1999). Although they often justified their efforts by noting that cooperative learning would lead to improved student learning, much of their work focused on facilitating students' cooperation skills

with the goal of improving those skills (e.g., Johnson & Johnson, 1986; Johnson, Johnson, & Holubec, 1993).

Of course, these are not mutually exclusive positions: Many scholars and educators in the collaboration-as-outcome camp feel strongly about collaboration as a process that can lead to important outcomes such as solving complex, interdisciplinary problems.

Perhaps the best current example of this conceptualization is the model of collaborative problem solving proposed by the Assessment and Teaching of 21st Century Skills (ATC21S) project (Griffin & Careet al., 2012). In this model, the collaborative problem-solving framework clearly delineates between social skills and cognitive skills. Social skills include participation, perspective taking, and social regulation, whereas cognitive skills include task regulation and learning/knowledge building (Hesse et al., 2012). Each category (e.g., task regulation) is then broken down into subcategories, with specific indicators and behavioral evidence for the existence of each subskill in students and groups. The AT21CS model emphasizes the development of both collaborative skills and the cognitive outcomes that can result from student mastery of those collaborative skills.

INTERVENTIONS AND EMPIRICAL STUDIES

Kuhn's (2015) review of research from the collaboration-as-pathway perspective makes several important observations about intervention studies. First and foremost, carefully controlled research on this topic is surprisingly rare, with few experimental studies that can be used to guide practice. Second, collaboration does not appear to benefit every student in every learning context—some students appear to learn more when working individually, at least at times. Third, studying the effects of groups is complicated. An "effective group" may be the result of one highly competent member dominating the group's activities, or it may be a function of a division of the labor in which no one individual in the group shows much evidence of growth. Fourth, a great deal of this intervention research is focused on the learning of individuals within groups,

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In a small, rural community just outside the suburbs of West Des Moines, Iowa, Van Meter Community School District is focusing on student learning beyond just academics. Integrating 21st Century Competencies, what we call our "District Vision Points" (https://sites.google.com/a/vmbulldogs.com/van-meter-teaching-learning/home), into everyday instruction is the focus of our school improvement work. Teams of teachers have embarked upon the process of defining the competencies, breaking it down into skill sets, and describing the learning progression from kindergarten through high school graduation.

Communication and collaboration were the first two competency statements fully developed and shared with all staff in January of 2015. To reflect on the regular integration of these competencies into K-12 teaching and learning, administrator walk-throughs and collaborative learning team goals were established. See collaboration learning progression here (http://bit.ly/1Pk9WMv). For external validation and feedback regarding the District Vision Points, a team from Eagle Rock School and Professional Development Center visited our district and completed an assets inventory.

After classroom observations and staff and student interviews, the findings from the Eagle Rock team indicated communication and collaboration competencies, the most developed competencies supported through professional collaboration, were regularly implemented into instruction. The findings supported the belief that learning time for teachers would impact the use of 21st century competencies in instruction.

The Van Meter Instructional Leadership Team used the results to capitalize on the work already gaining traction for other competencies in classrooms.

Action steps for the 2015 - 2016 school year include:

- Develop next competency, create and innovate, by creating K-12 learning progressions
- Use Project-Based Learning as a way to integrate the District Vision Points into instruction.
- Pilot innovative uses of time and schedules to move forward with competency-based education.

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not on the accomplishments of the groups themselves. Although this is understandable—such a focus helps address many of the complexities alluded to above—it limits the usefulness of this research for educators who are interested in group processes and group outcomes.

Nevertheless, the research on group effects on the cognitive outcomes of students is informative: Groups appear less effective when the desired outcomes involve rote learning; the nature of the problem being addressed by the group matters (i.e., well- vs. ill-structured; the value of collaboration may be due in large part to the metacognitive benefit of having peers examine and comment upon one's thinking; collaboration may be less effective for adolescents than younger and older students; collaboration may be more effective with STEM content than non-STEM content; and that task interdependence (when team members need to rely on each other to solve a task) may facilitate successful student outcomes (see extended discussions in Kuhn, 2015; Kyndt et al., 2013; Noroozi, Weinberger, Biemans, Mulder, & Chizari, et al., 2012). These findings are consistent with—but do not completely confirm—Johnson and Johnson's (1995) five characteristics of collaborative learning groups that promote learning: positive interdependence, face-to-face interaction, individual accountability for achieving the group's goals, use of interpersonal skills, and group evaluation of process in order to improve group effectiveness.

The research on collaboration and creativity, another 21st century skill, generally focuses on group outcomes: Are groups more creative than individuals working alone and pooling their ideas after the fact? The findings are generally negative, with most studies suggesting that people working in groups tend to be less creative than individuals working on similar problems (Diehl & Stroebe, 1987; Larey & Paulus, 1999; Thompson, 2003; West, Borrill, & Unsworth et al., 1998). Many studies have been conducted to identify both reasons for the negative effects of groups and possible interventions that increase group creativity.

Much of this research has focused on the relative roles of group dynamics in collaborative creativity. Although many of the studies have been conducted within organizational psychology or business settings, the principles remain the same. Not surprisingly, the factors that appear to lead to successful creative collaboration are similar to those that focus on other forms of student learning. These factors include the presence of a moderate amount of conflict (De Dreu, 2006; De Dreu & West, 2001; Kurtzberg & Amabile, 2000), a sense of psychological safety and a consensus that risk-taking is acceptable (Edmondson, 1999; Ford & Sullivan, 2004), and good intragroup communication (Detert & Burris, 2007; Roussin, 2008). Interestingly, ethnic, racial, and intellectual diversity in a collaborative setting tends to promote creativity at the group level, although gender diversity may not (Cady & Valentine, 1999; Choi, 2007; McLeod, Lobel, & Cox, 1996; Milliken & Martins, 1996; Paletz, Peng, Erez, & Maslach, 2004; West, 2002; Yap, Chai, & Lemaire, 2005). The diversity effect appears most pronounced when the collaboration occurs within a setting that values group outcomes more than individual outcomes (Chatman, Polzer, Barsade, & Neale, 1998).

The topic of whether external constraints, such as evaluations or rewards (or expected evaluation or rewards), have positive or negative effects on group creativity has been hotly debated for decades (e.g., Amabile, 1979; Cooper & Jayatilaka, 2006; West, 2002). No consensus has fully emerged at this point in time. That said, West's (2002) idea that external demands may negatively influence creativity but positively influence implementation of creative ideas is compelling and suggests that collaborative, creative tasks could possibly be structured with lower levels of external constraints for idea generation but higher levels of constraints during implementation phases of a project.

The critical thinking-collaboration research has shown that collaboration can enhance the development of critical thinking skills. In a study by Gokhale (1995), students performed both factual knowledge recall tasks and critical thinking tasks individually and as a group. Both methods of instruction were found to be effective in increasing factual knowledge; however, to enhance critical thinking and problem- solving skills, collaborative learning was significantly more beneficial due to providing students opportunities to discuss, clarify ideas, and evaluate others' ideas.

Creativity-collaboration research is also relevant because it implicitly highlights that working in a group and collaborating are not necessarily the same thing. Students working in a group may not be collaborating, and students who are collaborating may never be in the same room together. This point is the foundation for a great deal of work about collaboration and technology (Chamakiotis, Dekoninck, & Panteli, 2013; Cicconi, 2014; Kärkkäinen & Vincent-Lancrin, 2013; Lai & Hwang, 2014). With the huge advances in mobile technology over the past decade, many students now have numerous ways to access information and collaborate with peers (Bush & Hall, 2011). Although research on the effectiveness of, for example, synchronous and asynchronous technology-mediated collaboration is not common in K-12 settings, there is evidence that a research base will grow over the next few years. Creating this knowledge base will be a great help to educators and students.

ASSESSMENT

One difficulty with assessing collaboration is determining exactly what aspect is being assessed. Which is more important, individual or group outcomes following the collaboration, or an individual's ability to work with other team members? Traditionally, assessments have been more interested in the individual or group outcomes (Webb, 1997), although there has been significant recent research on the latter question of individual ability to work with other members of a team.

Another limitation of the assessment research is that, as Hesse et al. (2012) have noted, although "many problems in real life are collaborative and ill-defined, the vast majority of research on problem solving has dealt with well-defined problems that are presented to individuals" (p. 52).

There are a number of promising efforts to assess both student collaborative skills and the outcomes of collaborative problem solving. Chiu and Khoo (2003) studied the impact of rudeness during group work on later performance on a mathematics assessment. Rudeness was assessed by video recording the participants, and then later coding the interactions. This technique of recording and then coding has been used in other studies as well to measure transactive (Miell & McDonald, 2000) or verbal behaviors (Gillies, 2010). Assessments like these could be thought of as similar to the Consensual Assessment Technique developed by Amabile (1996) to measure creative work. If a rubric, or coding scheme, were developed to measure "good collaboration," it could be used on video recordings to assess the quality of student's collaboration. Rubrics like this have already been implemented in schools (Mercer, 1996) but have not been empirically validated. O'Neil, Allred, and Baker (1992) also proposed a framework of job readiness that encompassed collaborative skills,

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First graders from Spirit Lake, IA are using techology tools to collaborate with other first graders from across the US and Canada in order to meet the Common Core Technology Literacy Standards. They are using Twitter for book chats (#1bc15) and tweeting things such as, "What math do you see in this picture?" (#mtgr1) then discussing the tweets and pictures they get back from other classes. They have created a book Bingo (#bcbingo15) which they use to collaborate with other classes through Twitter, and are participating in weekly Google Hangouts to do choral readings and other collaborative activities, such as book writing, with partner classes. First graders are also using Kahoot to have friendly subject specific competitions with other first grade classrooms from across the US and Canada.

Many of these instructional practices make learning visible for assessment. When students are tweeting their book chat predictions and pictures of their mathematical thinking, teachers are able to assess the level of their understanding. These collaborative practices provide Spirit Lake students with multiple avenues for meeting the following Common Core Technology Literacy Standards:

21.K-2.TL.2 Use a variety of technology tools and media-rich resources to work collaboratively with others.

- In a collaborative work group, use a variety of technologies to produce a digital presentation or product in a curriculum area.
- Use technology resources for communicating and sharing ideas with others.
- Participate in learning activities with or about learners from other countries and/or cultures.

21.K-2.TL.3 Utilize predetermined digital resources and tools to answer questions or solve problems.

21.K-2.TL.4 Use technological resources to investigate given questions or problems.

- Use a variety of technology resources to explore questions or problems.
- Use technology to decide what information to locate and how to use that information to complete a project.
- Collect and explain data to identify commonalities or solutions to problems.
- Explore the different ways that problems may be solved.

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and could easily be worked into an assessment. There are also some assessments aimed at college populations (Judd, Kennedy, & Cropper, 2010), teachers (Woodland et al., Lee, & Randall, 2013), and medical students (Olupeliyawa et al., Balasooriya, Hughes, & O'Sullivan, 2014).

There appear to be four categories of assessment regarding student collaboration. The first two are set within the "collaboration as a process to achieve specific outcomes" paradigm and involve (1) group assessments of outcomes and (2) individual assessments of outcomes. The second two are set within the "collaboration skills as outcomes" paradigm and involve (3) group assessments of collaborative skills and (4) individual assessments of collaborative skills. The literature contains several assessments of the level of activity in each of the four areas, with somewhat mixed evaluations of progress in each area. After reviewing the research literature on this topic, our perspective is that significant work has been and is being done in each of the four areas. These efforts seem to defy the conventional wisdom that this is a neglected area of assessment. However, the degree to which this work is readily available for use in K-12 classrooms and out-of-school settings is an open question, although many researchers are currently addressing this issue.

Although less immediately applicable to K-12 classroom settings, the 2015 Programme for International Student Assessment (PISA) will, for the first time, include a collaborative problem-solving component. In 2012, the PISA assessed students' ability to solve problems individually. The 2015 assessment has shifted to a collaborative model to address the growing need, as detailed above, for greater emphasis on collaborative learning and students who can work in team environments more effectively. The methodologies being developed have the potential to influence K-12 assessment of collaboration in the future.

CONCLUSIONS AND RECOMMENDATIONS

The research on collaboration, reviewed briefly in this report and described in more detail in the accompanying annotated bibliography (URL), leads to a number of important conclusions and implications for practice, which are provided below.

Conclusion: Conceptions of collaboration have a long, rich history, but there is a significant diversity of perspectives in how scholars have thought about collaboration.

Recommendation: Schools should decide whether their educational goals in this area are focused on collaboration as a process, as an outcome in its own right, or a combination of these conceptualizations.

Recommendation: When focusing on student collaboration, educators should determine whether they are primarily interested in individual student outcomes, group outcomes, or both.

Conclusion: Intervention research provides evidence that collaboration is not desirable at all times in K-12 student learning.

Recommendation: Educators should expose students to a mix of collaborative and non-collaborative learning experiences.

Conclusion: A great deal of research has been conducted on how to structure collaborative activities in ways that optimize individual student learning; less research has focused on how to structure activities that teach collaborative skills for their own sake.

Recommendation: Schools interested in focusing on collaborative skills should consider using models that prioritize those outcomes, such as the P21 and ATC21S frameworks.

Conclusion: Four categories of assessments exist, with significant research and development efforts being conducted within each category.

Recommendation: The most appropriate set of assessments for a given educational context will depend on the interventions being used and the desired student outcomes.

Conclusion: Not enough research has been conducted to identify the optimal make-up of student teams to optimize learning.

Recommendation: Research must be focused on identification of key student characteristics and team configurations that optimize learning in various contexts.

Recommendation: Educators must work more closely with researchers to help gather empirical evidence related to collaboration for learning.

TABLE 1: What do we need to do?

Education Level	Intervention	Assessment	Evaluation
P-12 Classroom	Determine extent to which collaboration is being developed and modeled in the classroom environment; embed opportunities for collaboration into the classroom culture	Provide mix of collaborative and non-collaborative learning experiences; Embed collaboration into all aspects of student learning, curriculum and instruction; address diverse audiences and vehicles for collaboration	Evaluate both student collaboration and team building skills; incorporate assessment of collaboration as a major student outcome; regularly assess student's growth and report the results to parents
School	Examine how collaboration is being taught and demonstrated across classrooms and grades; ensure effective collaboration is embedded in school culture and learning spaces; focus educational goals on collaboration as a both process and/or outcome	Make collaboration skills a high priority; develop common vision, plan and strategy to include in teaching and learning; build staff capacity, allocate resources and support innovative teaching practices; adopt a framework for embedding collaboration skills and outcomes	Ensure assessment plan includes collaboration as key outcome and make changes where gaps exist; establish desired student collaboration outcomes; assess collaboration in all (as possible) assignments, projects and encourage the use of formative assessment to assess student growth
Out-of-School	Evaluate the extent to which programs, activities, spaces and culture support both collaborative and individual learning experiences; redesign learning/activity environment to close gaps	Incorporate collaboration into programs, activities and services; support building staff capacity through professional development and professional learning communities	Encourage student growth in collaboration as integral part of program outcomes; document evidence of collaborative learning experiences; track research development for application of collaborative outcomes rubrics
School District	Determine how resources are used to promote collaboration in learning spaces and culture; allocate resources as needed; encourage the inclusion of mediated interactions and blended learning opportunities	Provide PD and resources to schools to incorporate collaboration into teaching and learning; Prioritize development of mediated and team-building collaborative activities in curriculum and instruction	Develop and support 21st century assessment data systems for educators, parents, and students that include collaboration in a variety of settings; monitor and document student performance as interventions are implemented
State	Promote the incorporation of teaching practices and learning environments that promote collaboration	Develop curricula promoting collaboration through mediated and blended learning opportunities; provide districts with curricular and instructional resources, and professional development	Develop collaboration rubrics to assess student growth; incorporate evaluation of collaboration skills in all assessments; promote collaboration as a critical student outcome
National	Support ongoing research on effective collaboration and develop resources that help promote collaboration for learning	Fund research and development projects on interventions designed to increase students' 21st century collaboration skills	Focus research efforts to identify student outcomes and team configurations to optimize learning in various contexts; support development of high-quality collaboration assessments and rubrics

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Thompson, L., & Fine, G. A. (1999). Socially shared cognition, affect, and behavior: A review and integration. *Personality and Social Psychology Review*, 3(4), 278-302.

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Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wagner, T. (2010). *The global achievement gap: Why even our best schools don't teach the new survival skills our children need—and what we can do about it*. New York: Basic Books.

Wegerif, R., Mercer, N., & Dawes, L. (1999). From social interaction to individual reasoning: an empirical investigation of a possible socio-cultural model of cognitive development. *Learning and instruction*, 9(6), 493-516.

Wertsch, J. V., del Río, P., & Alvarez, A. (Eds.). (1995). *Sociocultural studies of mind*. New York: Cambridge University Press.

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Yap, C., Chai, K., & Lemaire, P. (2005). An empirical study on functional diversity and innovation in SMEs. *Creativity and Innovation Management*, 14, 176-190.

ANNOTATED BIBLIOGRAPHY

Collaboration is included in the P21 Framework for 21st Century Learning as one of the Learning and Innovation Skills (www.P21.org/Framework). Also known as the "4Cs," they include creativity, critical thinking, collaboration, and communication.

Collaboration is frequently mentioned as a key skill for workforce success. In this annotated bibliography, an emphasis was placed on resources that are likely to be found online or in most university and many public libraries, that are especially comprehensive, are accessible to the lay reader to the extent possible, and collectively represent the major figures in the field.

The collaboration bibliography was compiled by Jiajun Guo, Ronald Beghetto, James Kaufman, and Jonathan Plucker at the University of Connecticut's Neag School of Education. They appreciate the assistance of Lamies Nazzal and Anna Dilley and the helpful feedback and recommendations provided by the P21 Staff.

GLOSSARY

Cooperative Learning – an instructional method in which students work together in small, heterogeneous groups to complete a problem, project, or other instructional goal, while teachers act as guides or facilitators.

Decentering – the ability to consider multiple perspectives and accommodate the conflicting information.

Exploratory Talk – thinking aloud, and taking the risk to let others hear and comment on partly formed ideas

Ground Rule – a basic principle in a given field.

Interdependence – when two or more things depend on each other.

Metacognitive Scaffolding – questions, prompts, or cues that helps students to think about their thinking.

Social Constructivism – a theory of learning proposed by Vygotsky that emphasizes the interpersonal dimensions of learning.

Structured Group – some key elements of cooperative learning—such as positive interdependence, promotive interaction, individual accountability, interpersonal and small-group skills, and group processing—are present.

Zone of Proximal Development – the developmental area between a child's level of independent (what he/she can do alone) and the child's level of assisted (what he/she can do when scaffolded by teachers or more competent peers) performance.

BROAD OVERVIEWS

These resources are edited volumes that contain a wide range of theory and research related to creativity and innovation.

Gillies, R. M. (2007). *Cooperative learning: Integrating theory and practice*. Thousand Oaks, CA, US: Sage Publications, Inc.
This book highlights the strategies teachers can use to challenge student thinking and scaffold their learning as well as the strategies students can be taught to promote discourse, problem-solving, and learning during cooperative learning.

Gillies, R. M., & Ashman, A. F. (2003). *Co-operative learning: The social and intellectual outcomes of learning in groups*. New York, NY, US: Routledge.
The volume provides international insights, describes a number of studies and identifies a range of challenges for cooperative learning theory.

Littleton, K., Miell, D., & Faulkner, D. (2004). *Learning to collaborate, collaborating to learn*. New York: Nova Science Publishers.
This book brings together the work from researchers, working across Europe and North America, who have interests in collaborative learning and share the same desire to understand and promote educationally productive collaborative work.

O'Donnell, A. M., Hmelo-Silver, C. E., & Erkens, G. (2006). *Collaborative learning, reasoning, and technology*. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.
In this book, an international group of educational researchers presents original findings of how technology can be used to scaffold the development of critical reasoning skills, collaboration, and argumentation in both students and teachers at the K-12 and college levels.

Sharan, S. (1994). *Handbook of cooperative learning methods*. Westport, CT, US: Greenwood Press/Greenwood Publishing Group.
This handbook focuses on the application of cooperative learning to a wide range of academic disciplines, as well as on the challenges facing long-term implementation of cooperative learning at the school level.

GOOD REVIEWS

Cohen, E. G. (1994). Restructuring the classroom: Conditions for productive small groups. *Review of Educational Research*, 64(1), 1.
This review includes research that manipulated features of cooperative learning as well as studies of the relationship between interaction in small groups and outcomes. The analysis examines the kinds of discourse that are productive for different types of learning and moves toward studies of task and interaction.

O'Donnell, A. M. (2006). The role of peers and group learning. In P. A. Alexander, & P. H. Winne (Eds.), *Handbook of educational psychology* (2nd ed., pp. 781-802). Mahwah, New Jersey: Lawrence Erlbaum Associates.
This book chapter focused on promoting a coherent and principled approach to the use of varied models of peer learning to fit the teacher's instructional goals for students. The author summarized some key orientations to peer learning and a number of techniques based on these theoretical perspectives.

Slavin, R. E. (1996). Research on cooperative learning and achievement: What we know, what we need to know. *Contemporary Educational Psychology*, 21(1), 43-69.
This is an excellent review of current research on cooperative learning and student achievement. The author identified four major theoretical perspectives, including motivational, social cohesion, developmental, and cognitive elaboration perspectives, in explaining the achievement effects of cooperative learning. Factors contributing to these effects were discussed, and the importance of group goals and individual accountability are considered.

Webb, N. M., & Palincsar, A. S. (1996). Group processes in the classroom. In D. C. Berliner, & R. C. Calfee (Eds.), (pp. 841-873). New York, NY, US; London, England: Macmillan Library Reference Usa; Prentice Hall International.
This review discusses current research on group processes in the classroom: the processes taking place in peer-led groups that shape learning, and the impact of different group and classroom structures on the group processes that emerge.

THEORIES, PERSPECTIVE, AND MODELS

Achinstein, B. (2002). *Conflict amid community: The micropolitics of teacher collaboration*. Teachers College Record, 104(3), 421-455.
Unlike collaborations among students, collaboration among teachers seems much more complicated. This study, using a micropolitical analysis, suggested that counter to the consensus-based literature on teacher community, teachers engaged in collaboration generate and at times thrive on conflict.

Johnson, D. W., & Johnson, R. T. (2005). New developments in social interdependence theory. *Genetic, Social, and General Psychology Monographs*, 131(4), 285-358.
The author critically analyzed the new developments of social interdependence theory, a classic interaction theory that has been modified, extended, and refined since its formulation several decades ago. Over 750 research studies related to interdependence theory were reviewed and synthesized.

Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational Researcher*, 38(5), 365-379.
This paper describes how social and educational psychology has contributed to educational practice by summarizing social interdependence theory, giving an overview of relevant research, and discussing the application of the theory to education.

O'Donnell, A. M., & King, A. (1999). *Cognitive perspectives on peer learning*. Mahwah, N.J.: L. Erlbaum.
This book focuses on approaches that are concerned with the cognitive processes underlying peer learning. It discusses cognitive processes form developmental, information processing, or more generally, constructivist perspectives on peer learning.

Tyler, T., Degoey, P., & Smith, H. (1996). Understanding why the justice of group procedures matters: A test of the psychological dynamics of the group-value model. *Journal of Personality and Social Psychology*, 70(5), 913-930.
A set of four studies were conducted to show procedural justice can influence group-oriented behaviors and attitudes. A group-value model was proposed and tested. Although none of these studies was conducted in K-12 educational settings, they have implications for group collaborations in K-12 classrooms. This is especially true in heterogeneous group. "Pride" and "Respect" are two central concepts that can influence group processes.

Webb, N. M. (1995). *Testing a theoretical model of student interaction and learning in small groups*. In R. Hertz-Lazarowitz, & N. Miller (Eds.), (pp. 102-119). New York, NY, US: Cambridge University Press.
To clarify important features of group interaction that may be amendable to change in order to maximize the learning of students within groups, this book chapter described and tested a model of peer interaction and learning in small groups.

Webb, N. M. (1997). Assessing students in small collaborative groups. *Theory into Practice*, 36(4), 205.
This article describes different purposes of assessment, how processes occurring during group collaboration may work for or against the purpose of an assessment, how to design assessments so that the goals are clear and consistent, what issues are involved in assigning students to groups, and implications for practice.

Wegerif, R., Mercer, N., & Dawes, L. (1999). From social interaction to individual reasoning: An empirical investigation of a possible socio-cultural model of cognitive development. *Learning and Instruction*, 9(6), 493-516.
This study Examined a possible socio-cultural model of cognitive development by investigating whether "exploratory talk", a type of talk in which joint reasoning is made explicit, can be taught. The findings supported this claim and the hypothesis that experience of social reasoning can improve scores on measures of individual reasoning.

CLASSIC PROJECTS/PROGRAMS

Curry, M. (2008). Critical friends groups: The possibilities and limitations embedded in teacher professional communities aimed at instructional improvement and school reform. *Teachers College Record*, 110(4), 733-774.
This study analyzes how Critical Friend Groups (CFG), a teacher collaborative learning community, at the high school level constitute a resource for school reform and instructional improvement. It was found that, on the one hand, the CFG enhanced teachers' collegial relationships, their awareness of research-based practices and reforms, their school wide knowledge, and their capacity to undertake instructional improvement; on the other hand, these professional communities offered an inevitably partial combination of supports for teacher professional development.

Gillies, R. M. (2003). Structuring cooperative group work in classrooms. *International Journal of Educational Research*, 39(1-2), 35-49.
This paper provides an overview of five different studies that the author has conducted that demonstrate the importance of explicitly structuring cooperative small-group work in classrooms. Research demonstrated that the benefits of cooperative learning are enhanced when groups do not exceed four members, are gender-balanced and of mixed-ability, instruction is designed to meet the group needs, and teachers have been trained in how to implement pedagogical strategy.

Johnson, D. W., & Johnson, R. T. (1999). Making cooperative learning work. *Theory into Practice*, 38(2), 67.
In this article, the authors briefly introduced the formation of the Cooperative Learning Center at the University of Minnesota. With a focus on five main areas, the Center soon discovered some important issues in cooperative learning, such as different types of cooperative learning, what is and is not a cooperative effort, the five basic elements that make cooperation work, and the outcomes that result when cooperation is carefully structured.

Palincsar, A. S., & Herrenkohl, L. R. (1999). *Designing collaborative contexts: Lessons from three research programs*. In A. M. O'Donnell, & A. King (Eds.), (pp. 151-177). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.
The author described three instructional contexts that were designed to promote collaboration among children. These contexts were based on three programs of research from which three features were extracted: the support of interactive patterns, the nature of the problem space, and the process of creating a social context.

Slavin, R. E. (1999). Comprehensive approaches to cooperative learning. *Theory into Practice*, 38(2), 74.
In this paper two programs, Success for All and Roots & Wings were highlighted to demonstrate the success stories of embedding cooperative learning principles into instruction, curriculum, and school organization. The two programs created a structure within which high-quality implementation of cooperative methods could have a profound impact on student achievement.

Wegerif, R., Linares, J., Rojas-Drummond, S., Mercer, N., & Velez, M. (2005). Thinking together in the UK and Mexico: Transfer of an educational innovation. *Journal of Classroom Interaction*, 40(1), 40-48.
This study compared the implementation of Thinking Together approach in two countries: Mexico and UK. This approach was first developed in UK to promote the use of exploratory talk in primary classroom. Both programs appeared to have similar positive effects on the capacity of children to collaboratively effectively in groups.

TEACHERS' ROLE AND PEDAGOGY

Baines, E. (2009). *Promoting effective group work in the primary classroom: A handbook for teachers and practitioners*. London: Routledge.
This book is packed with valuable strategies for teachers wishing to make group work a more effective and successful way of learning.

Coleman, E. B. (1998). Using explanatory knowledge during collaborative problem solving in science. *Journal of the Learning Sciences*, 7(3-4), 387-427.
This research evaluates the effects of a scaffolded explanation-based approach to collaborative discussion on students' understanding of photosynthesis. This approach consists of instruction and prompts encouraging students to engage in the processes of explaining and justifying one's personal knowledge and comparing it to scientific knowledge.

Gillies, R. M., & Ashman, A. F. (1996). Teaching collaborative skills to primary school children in classroom-based work groups. *Learning and Instruction*, 6(3), 187-200.
This paper reported the effect of collaborative training on children's behavioral interactions and achievement. It was found that training could not only increase cooperative and helping behaviors but also promoting autonomy with learning and other higher learning outcomes.

Howe, C., & Tolmie, A. (2003). Group work in primary school science: Discussion, consensus and guidance from experts. *International Journal of Educational Research*, 39(1-2), 51-72.
The paper reported a study that tests a proposal, which came from a previous study, for solving potential problems in science group work. The results are consistent with what the previous study reports, although there are subtle differences in both outcome and process.

Howe, C., Tolmie, A., Thurston, A., Topping, K., Christie, D., Livingston, K., Jessiman, E., Donaldson, C. (2007). Group work in elementary science: Towards organizational principles for supporting pupil learning. *Learning and Instruction*, 17(5), 549-563.
This study, which was conducted in authentic classrooms, found that group work played a critical role in promoting students' understanding of science concepts. Organizational principles are extrapolated from the findings, which could be readily adopted in classrooms.

Meloth, M. S., & Deering, P. D. (1999). *The role of the teacher in promoting cognitive processing during collaborative learning*. In A. M. O'Donnell, & A. King (Eds.), (pp. 235-255). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.
The paper reviews research on 3 aspects of the teacher's role in the classroom during collaborative learning: the role of providing direct instruction in preparing students prior to group work, the teacher's monitoring practices during group work, and the teacher's beliefs about learning and collaboration.

O'Donnell, A. M. (1999). *Structuring dyadic interaction through scripted cooperation*. In A. M. O'Donnell, & A. King (Eds.), (pp. 179-196). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.
The paper examines research findings on scripted cooperation (SC), a peer learning technique that structures interactions among participants using a script that requires engagement in a specific cognitive activity.

Webb, N. M., Nemer, K. M., & Ing, M. (2006). Small-group reflections: Parallels between teacher discourse and student behavior in peer-directed groups. *Journal of the Learning Sciences*, 15(1), 63-119.
This article describes teacher's discourse and examines whether and how students reproduce the discourse in the context of a semester-long program of cooperative learning in four middle school mathematics classrooms.

Webb, N. M. (2009). The teacher's role in promoting collaborative dialogue in the classroom. *British Journal of Educational Psychology*, 79(1), 1-28.
This paper reviews research that explores the role of the teacher in promoting learning in small groups. The focus is on how students can learn from their peers during small-group work, how teachers can prepare students for collaborative group work, and the role of teacher discourse and classroom norms in small-group dialogue.

FACTORS THAT MAY AFFECT COLLABORATION

Chiu, M. M., & Khoo, L. (2003). Rudeness and status effects during group problem solving: Do they bias evaluations and reduce the likelihood of correct solutions? *Journal of Educational Psychology*, 95(3), 506-523.
It was found that members of unsuccessful groups were more likely to be rude and were more likely to let their evaluations be affected by rudeness. Members of successful groups tended to be less rude, to differ to group members with higher mathematics status, and to justify when anticipating disagreements.

Cohen, E. G., Lotan, R. A., Abram, P. L., Scarloss, B. A., & Schultz, S. E. (2002). Can groups learn? *Teachers College Record*, 104(6), 1045-1068.
This study tested the proposition that providing students with specific guidelines as to what makes an exemplary group product (evaluation criteria) will improve the character of the discussion as well as the quality of the group product.

Gillies, R. M. (2006). Teachers' and students' verbal behaviours during cooperative and small-group learning. British *Journal of Educational Psychology*, 76(2), 271-287.
To examine teacher's role in promoting interactions among students, the author analyzed both teachers' and students' language during the implementation of cooperative learning framework. Results shows that teacher who implemented cooperative learning engaged in more mediated-learning interactions. Furthermore, the students modeled many of these interactions in their groups.

Jeong, H., & Chi, M. T. H. (2007). Knowledge convergence and collaborative learning. *Instructional Science*, 35(4), 287-315.
This paper operationalized the notion of knowledge convergence, which is defined as an increase in common knowledge, and assessed quantitatively how much knowledge convergence occurred during collaborative learning. Common knowledge refers to the knowledge that all collaborating partners have.

Miell, D., & MacDonald, R. (2000). Children's creative collaborations: The importance of friendship when working together on a musical composition. *Social Development*, 9(3), 348-369.
This study examined the social processes involved in children's collaborative musical compositions. Results indicates some of the ways in which friendship influences the collaborative process in a creative, open-ended task by facilitating a high level of mutual engagement during the interaction and with the outcome of higher quality compositions.

Roseth, C. J., Johnson, D. W., & Johnson, R. T. (2008). Promoting early adolescents' achievement and peer relationships: The effects of cooperative, competitive, and individualistic goal structures. *Psychological Bulletin*, 134(2), 223-246.
In this study the authors tested a social-contextual view of the mechanisms and processes by which early adolescents' achievement and peer relationships may be promoted simultaneously.

Simon, B., & Stürmer, S. (2003). Respect for group members: Intragroup determinants of collective identification and group-serving behavior. *Personality and Social Psychology Bulletin*, 29(2), 183-193.
The research presented in this article strongly suggests that intragroup respect is an important determinant of collective identification and group-serving behavior.

Webb, N. M., Troper, J. D., & Fall, R. (1995). Constructive activity and learning in collaborative small groups. *Journal of Educational Psychology*, 87(3), 406-423.
In this empirical study, two student behaviors, receiving explanations and subsequently carrying out constructive activity, were identified to best predict mathematics learning in peer-directed small groups. Furthermore, level of constructive activity was the strongest predictor of achievement.

Webb, N. M., Mari Nemer, K., & Zuniga, S. (2002). Short circuits or superconductors? effects of group composition on high-achieving students' science assessment performance. *American Educational Research Journal*, 39(4), 943-989.
This study examined the role of group processes in the performance of high-ability students on collaborative science assessment. Although previous studies showed that high-ability students suffered a disadvantage by working in heterogeneous groups, this study suggests that the performance of high-ability students suffers only in poorly functioning heterogeneous groups.

COLLABORATIVE COMMUNICATION

Chinn, C. A., Anderson, R. C., & Waggoner, M. A. (2001). Patterns of discourse in two kinds of literature discussion. *Reading Research Quarterly*, 36(4), 378-411.
In this study, the effects of two instructional frames for discussion—traditional Recitations and an alternative to Recitations called Collaborative Reasoning—on patterns of discourse were examined. In comparison to Recitations, Collaborative Reasoning discussions produced greater engagement and more extensive use of several higher level cognitive processes.

Chinn, C. A., O'Donnell, A. M., & Jinks, T. S. (2000). The structure of discourse in collaborative learning. *Journal of Experimental Education*, 69(1), 77-97.
The authors examined the types of discourse structures that emerge during peer learning and the ways in which those structures are related to learning. The results demonstrate the importance of considering the structure of peer discourse as a mediator of what students learn from peer interactions.

Hogan, K., Nastasi, B. K., & Pressley, M. (1999). Discourse patterns and collaborative scientific reasoning in peer and teacher-guided discussions. *Cognition and Instruction*, 17(4), 379-432.
To understand how knowledge is constructed in classroom communities, the author analyzed both teacher-student discourse and student-student discourse in science classes. It was found that teacher-guided discussions were a more efficient means of attaining higher levels of reasoning and higher quality explanations, but peer discussions tended to be more generative and exploratory. Ill-defined problem is another key factor that can promote thinking and reasoning in groups.

Mercer, N. (1996). The quality of talk in children's collaborative activity in the classroom. *Learning and Instruction*, 6(4), 359-377.
From a sociocultural perspective, the author analyzed the quality of observed talk of children working together on educational activities in primary school classrooms. It was argued that talk is a social mode of thinking, a tool for the joint construction of knowledge by teachers and learners. Therefore, teacher, as the organizer of collaborative activity, play an important role in guiding students' talk. Besides, the author also suggested that more research is needed to produce information regarding practical classroom applications.

Rojas-Drummond, S., & Mercer, N. (2003). Scaffolding the development of effective collaboration and learning. *International Journal of Educational Research*, 39(1-2), 99-111.
This paper introduced a series of studies conducted in Mexico and UK that aimed at increasing children use of Exploratory Talk, a way that can engage peers critically but constructively with each other's ideas, in group activities. These studies also provided insights into the functions of teacher-pupil interaction.

EQUITY ISSUES

Cohen, E. G., & Lotan, R. A. (1995). Producing equal-status interaction in the heterogeneous classroom. *American Educational Research Journal*, 32(1), 99-120.
The article presents a test of two interventions derived from expectation states theory and designed to counteract the process of stratification in classrooms using academically heterogeneous small groups.

Cohen, E. G., Lotan, R. A., Scarloss, B. A., & Arellano, A. R. (1999). Complex instruction: Equity in cooperative learning classrooms. *Theory into Practice*, 38(2), 80.
This paper described Complex Instruction (CI), an instructional approach that allows educators to use cooperative group work to teach at a high academic level in diverse classrooms.

Slavin, R. E., & Cooper, R. (1999). Improving intergroup relations: Lessons learned from cooperative learning programs. *Journal of Social Issues*, 55(4), 647-663.
This article discusses the need for cooperative learning groups in integrated schools in order to promote more cross-race relationships than might otherwise be the case. The author reviewed research on eight cooperative learning procedures. The research suggested that students are not only acquiring academic knowledge but also establishing group culture, a culture that can improve intergroup relations among students of different racial and ethnic backgrounds.

Webb, N. M., Nemer, K. M., Chizhik, A. W., & Sugrue, B. (1998). Equity issues in collaborative group assessment: Group composition and performance. *American Educational Research Journal*, 35(4), 607-651.
This study investigated the effects of group ability composition on group processes and outcomes in science performance assessments. It was found that heterogeneous groups may provide a greater benefit for below-average students than they impose a detriment on high-ability students.

TECHNOLOGY AND COLLABORATION

Dillenbourg, P. (1999). *Collaborative learning: Cognitive and computational approaches*. Amsterdam; New York: Pergamon.
This book intended to illustrate the benefits of collaboration between scientists from psychology and computer science, namely machine learning, and most of the chapters are co-authored by scholars from both sides.

Kershner, R., Mercer, N., Warwick, P., & Staarman, J. K. (2010). Can the interactive whiteboard support young children's collaborative communication and thinking in classroom science activities? *International Journal of Computer-Supported Collaborative Learning*, 5(4), 359-383.
This study focuses on children's communication and thinking during their semi-autonomous use of the interactive whiteboards (IWB) during collaborative groupwork in primary school science lessons, aiming in part to see if the IWB is suited to this type of use. Both advantages and disadvantages were discussed in the article.

O'Donnell, Angela M., Hmelo-Silver, Cindy E., Erkens, Gijsbert. (2006). *Collaborative learning, reasoning, and technology*. Mahwah, N.J.: L. Erlbaum Associates.
This volume presents research findings on the use of technology to support learning and reasoning in collaborative contexts. There are mainly two central themes: the use of technology as a scaffold for learning, and the use of technology to promote argumentation and reasoning.

Warwick, P., Mercer, N., Kershner, R., & Staarman, J. K. (2010). In the mind and in the technology: The vicarious presence of the teacher in pupil's learning of science in collaborative group activity at the interactive whiteboard. *Computers and Education*, 55(1), 350-362.
It was concluded that the interactive whiteboard (IWB) can provide both a tool and an environment that can encourage the creation of a shared dialogic space within which co-constructed knowledge building can take place. However, this only occurs where there is active support from the teacher for collaborative, dialogic activity in the classroom and where the teacher is able to devise tasks that use board affordances to promote active learning and pupil agency.

BENEFITS

Barron, B. (2003). When smart groups fail. *Journal of the Learning Sciences*, 12(3), 307-359.
Using both qualitative and quantitative method, Barron found that group interactions, such as characteristics of proposals and partner responsiveness, rather than prior achievement and performance, accounted for the differences between successful and unsuccessful groups in problem solving.

Gillies, R. M. (2004). The effects of cooperative learning on junior high school students during small group learning. *Learning and Instruction*, 14(2), 197-213.
This study found that the children in structured groups were more willing to work with others on the assigned tasks and they provided more elaborate help and assistance to each other than their peers in unstructured

groups. Furthermore, as the children in structured groups had more opportunities to work together, they developed a stronger perception of group cohesion and social responsibility for each other's learning than their peers in unstructured groups.

P21 MEMBERS ORGANIZATIONS

AFT

American Camp Association

Apple Inc.

Asia Society

Bahcesehir K-12 Schools

Cable Impacts Foundation

Common Sense Media

Crayola

Destination Imagination

Duck Learning

EF Education First

ENA

First Five Years Fund

Fisher-Price

Ford Motor Company Fund

Future Problem Solving Program International

Gale Cengage Learning

The Goddard School

Intel Corporation

Learning.com

LEGO Education

National Board for Professional Teaching Standards

National Education Association

PBS

Pearson

People to People International

Playworld, Inc.

Project Management Institute Educational Foundation

VIF International Education

The Walt Disney Company

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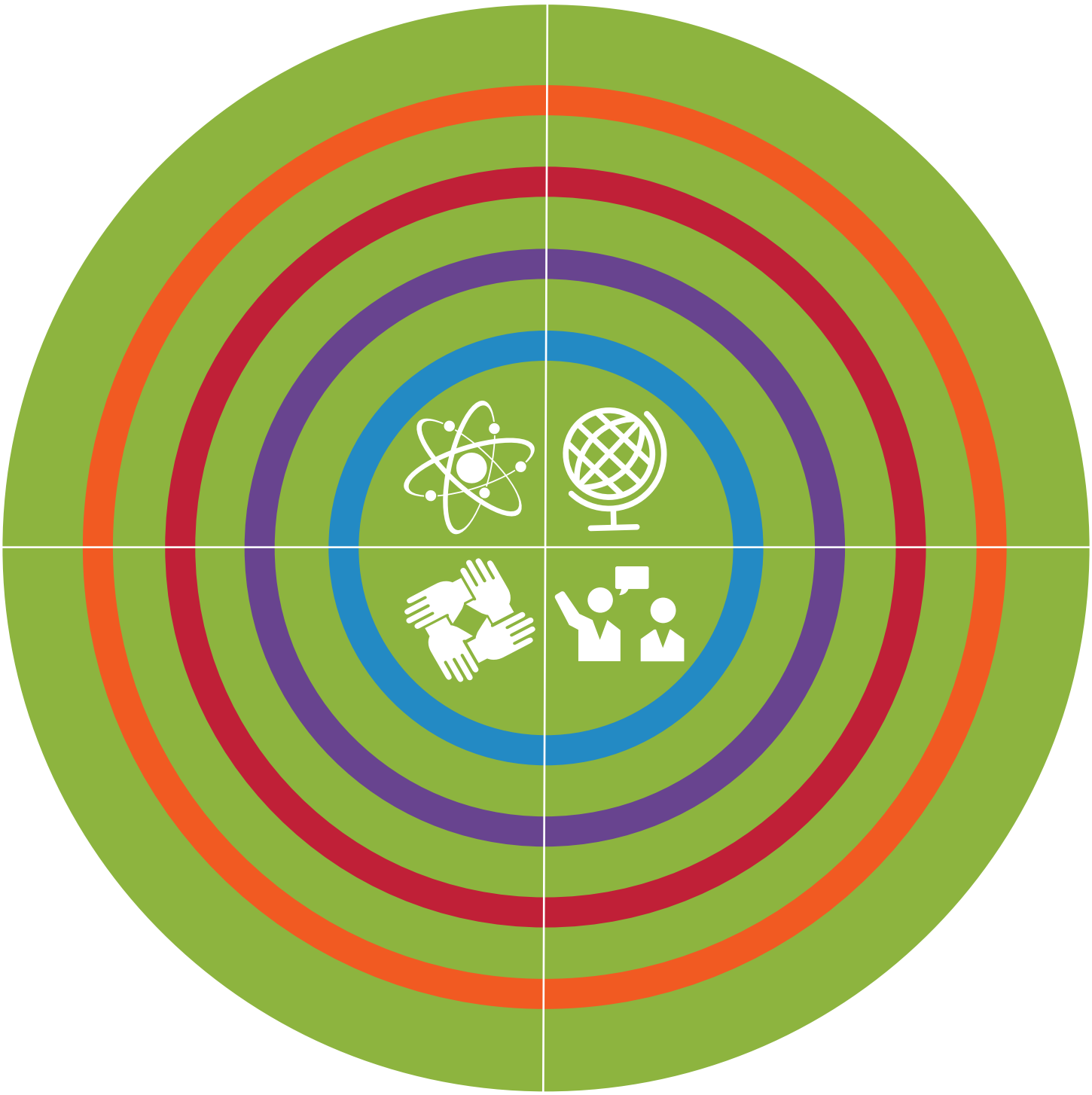
To learn more about P21, the Partnership for 21st Century Learning, and our work please visit www.P21.org.



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