

# INSTRUCTIONAL TECHNOLOGY AND COLLABORATIVE LEARNING BEST PRACTICES:

Global Report and Recommendations

July 2012 | Author: Filigree Consulting

# Executive summary

SMART Technologies recently commissioned a global research study in order to get a better understanding of measurable outcomes as they relate to investment in collaboration technology.

The results indicated that participants viewed technology as an important enabler for improving student learning outcomes. However, a sound teacher and student support system, training, high-quality content and several other best practices were necessary to get the greatest value from technology.

Technology is viewed as an important enabler for improving student learning outcomes.

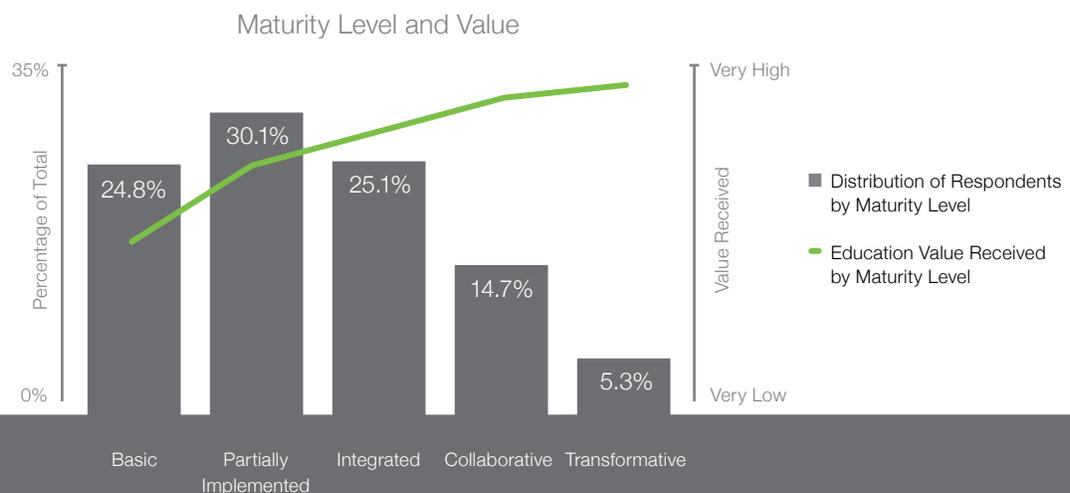
Best practices are necessary to get the greatest value.

The study showed that “value” in education is measured by student outcomes, teacher outcomes and the ability to adapt to new pedagogical tools and models – just to name a few. The ultimate goal is to set students up for success.

The research results showed that not only was a sound selection of well integrated technology products necessary, but almost all of the thirty-two practices that were tested had a significant impact on value. Moreover, while all made some contribution to value, some were absolutely critical.

## Higher levels of collaboration deliver greater results

Only about 5% of the study participants attained the highest level, the transformative level of collaboration. They had consistently high scores across all the best practices and achieved the highest level of value of any group of participants. On a numeric scale they achieved about twice as much value from their technology investments as those at a basic level of maturity. The chart below summarizes this result. About one quarter of the respondents were at the basic level and achieved moderate value from their instructional technology. About 5% of the respondents were at the transformative level and achieved very high value in the context of student outcomes, teacher outcomes and the enablement of advanced learning methods.



## Five levels of collaboration maturity

As part of the research analysis and synthesis process, the participants were grouped into maturity levels based on their performance in best practices. These five levels of maturity were defined as:

<b>Basic:</b> Instructional technology, process and strategy are insufficiently developed to positively impact student and teacher outcomes.
<b>Partially Implemented:</b> Instructional technology is implemented with limited reach and minimal function. Technology elements do not effectively work together to maximize student and teacher outcomes.
<b>Integrated:</b> Instructional technology is broadly implemented. Pedagogical processes have evolved to effectively use technology in the classroom to begin collaborative learning.
<b>Collaborative:</b> Collaborative learning is enhanced by the power of technology, processes and people. Students are enabled to collaborate in their own settings and environments to leverage and build on their learning.
<b>Transformative:</b> Collaborative learning and advanced instructional models are fully supported by technology, people and processes.

## Success requires a comprehensive approach

Achieving high value takes commitment to success every step of the way – from installation to inspiration to practice excellence. That means teaching the teachers to use products effectively, providing effective guidance and support when required and ensuring teachers have high-quality digital content that's relevant to the subjects being taught. It means selecting products that integrate easily with each other and with existing technology. It also means a focus on practices that enable the ability to adapt to new pedagogical tools and models, including integrated learning spaces and flexible learning environments.

Once a solution is found and best practices that embrace all of these elements are instituted, only then will the investment in technology be much more likely to pay off. Teachers and technology staff will have the confidence to embrace and use classroom technology as a key pedagogical tool. And students will become the real winners by experiencing an immediate and profound effect on learning.

## Take a free assessment survey

A self-assessment has been made available to help administrators, teachers and public officials involved in education to leverage this research. If you are interested in assessing your school or jurisdiction, SMART's self-assessment tool is available at [smarttech.com/assessment21](https://smarttech.com/assessment21).

# Why instructional technology solutions

The study found that high-quality, richly-integrated instructional technology solutions, along with sound implementation support and best practices are linked directly to outcomes.

Instructional technology solutions supported by best practices are reported to have a statistically significant, positive impact on student achievement, student engagement that led to decreased absenteeism, a rise in teacher effectiveness, an improvement in the overall student experience and the ability to test and implement new teaching models such as blended learning and technology-enabled student collaboration.

The impact of instructional technology and best practices can be seen in five areas:

- Instructional technology can significantly expand the breadth and depth of the curriculum. Breadth is expanded by the ability to access information external to the classroom, either through simple Internet access and search/curation activities or through the profound impact of individualized learning and adaptation to students' specific learning styles.
- Instructional/collaboration technology can change the role of the school. Instruction can change from lecture to interaction to collaboration. Instruction can be teacher delivered, individual student driven or small-group oriented.
- Instructional technology can remove barriers. Instruction may extend beyond the school building or the classroom. Remote learning and small group ad hoc or informal collaboration can also provide instructional value.
- Instructional technology can provide extremely powerful feedback loops. Students can get immediate feedback and make corrections to their work. Teachers can create learning experiences around individual student needs and can effectively manage and improve whole-class, small-group and 1:1 learning experiences.

Instructional technology solutions supported by best practices have a statistically significant, positive impact on student achievement and engagement, teacher effectiveness and teaching innovation.

## Why collaborative learning

IBM's latest global CEO study\* ranked collaboration as the number one trait that CEOs seek in new employees.

In a simple sense, collaborative learning is about two or more people learning something together. Collaborative learning is heavily rooted in the idea that learning is inherently social and can be facilitated with technology and practices. Collaborative learning refers to environments in which learners engage in a common task where each individual depends on, and is accountable to, each other. It not only teaches social skills but facilitates retention, improves the experience and enhances creativity.

Perhaps most importantly, collaborative learning prepares students for their future roles in life as learners and contributors in their careers and in social settings. IBM's latest global CEO study\* ranked collaboration as the number one trait that CEOs seek in new employees as part of their efforts to create a more collaborative culture. In education, creating a 21<sup>st</sup> century learning environment is seen by thought leaders as essential to preparing students for future success.

\* Source: IBM C-Suite Studies (2012) Leading through Connections; Insights from the Global Chief Executive Officer Study. Retrieved from <http://www-935.ibm.com/services/us/en/c-suite/ceostudy2012/>

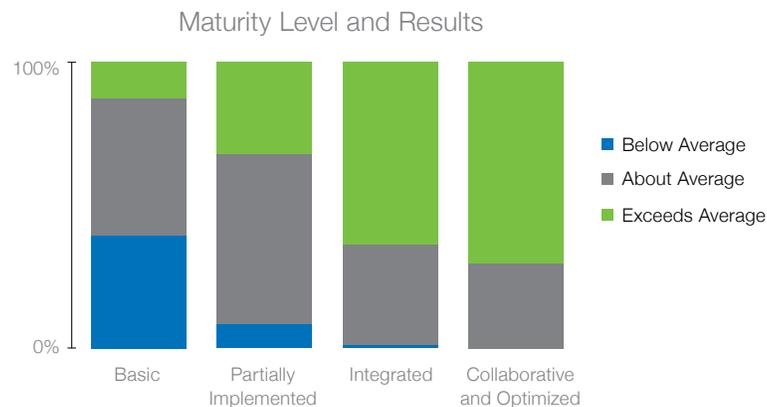
# High impact results

The key research findings include:

## The connection of technology and practices with value is strong and positive

The graph below depicts the relationship between collaboration maturity (as a function of technology adoption and best practices performance) and the value the participants reported from their investment compared to other investments in technology and process. The data indicates that those performing at low levels of maturity achieve lower value from their investment.

- At the Basic level, close to 40% of participants reported value below average.
- About 8% of participants at the Partially Implemented level report below average value from their investment.
- Participants at the Integrated level report below average results 1% of the time and exceeding average results 64% of the time.
- Responses from those participants at the collaborative or transformative level of maturity were combined for reporting due to the small number of responses in the transformative level. 70% of the combined group achieved above average value from their investment.



Maximum value is achieved by implementing a high level of instructional technology and focusing on best practices.

The research is clear: if you want maximum value from your technology investment (outcomes, measured success, improvements on test scores, etc.), you should implement a high level of instructional technology and focus on the best practices. Further details are provided later in the paper.

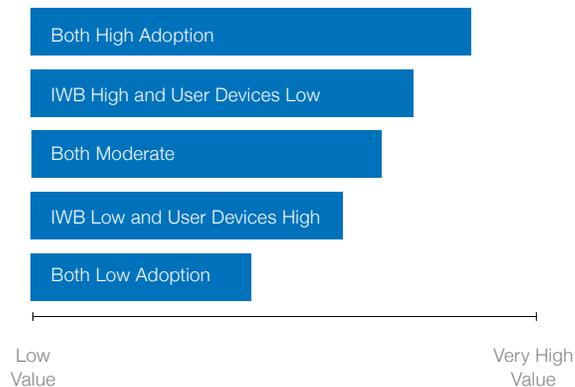
## Technology mix and resulting value

Flexible or blended learning environment are facilitated by the effective implementation of interactive whiteboards and personal devices. The combination of interactive whiteboards and personal devices drives more value than either in isolation.

Interactive whiteboards that have inherent integration capabilities can drive more value than PCs or tablets alone, as revealed by the respondents to the survey. In concert with individual devices, interactive whiteboards enable teachers to move seamlessly between whole-class instruction using the interactive whiteboards, small-group student collaboration facilitated by the large interactive displays and individual learning using personal devices, as long as the interactive whiteboard software enables easy connectivity with the individual devices. This ability to create flexible learning drives higher value.

The combination of interactive whiteboards and personal devices enable teachers to move between whole-class instruction, small-group student collaboration and individual learning.

### Interactive Whiteboards and Personal Devices



The chart on the left displays the average value achieved based on the adoption of various combinations of interactive whiteboards (IWB) and user devices (PCs, tablets, etc.). The differences displayed are statistically significant at the .140 level.

Adoption was measured on an eight point scale ranging from “do not use” to “more than 75% of potential users have access”. Thus adoption, in this case, not only measures basic adoption but includes the concept of user base penetration. In the analysis of whiteboards and user devices the bar was set high for adoption at “50% or more users have access” and low adoption at “less than 10% have access”.

### Summary:

- The highest value is achieved from high adoption of both interactive whiteboards and personal devices.

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- Next highest is achieved from high adoption of IWB and low adoption of user devices.

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- Moderate adoption of both is next.

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- Adoption of user devices with low adoption of IWB is next.

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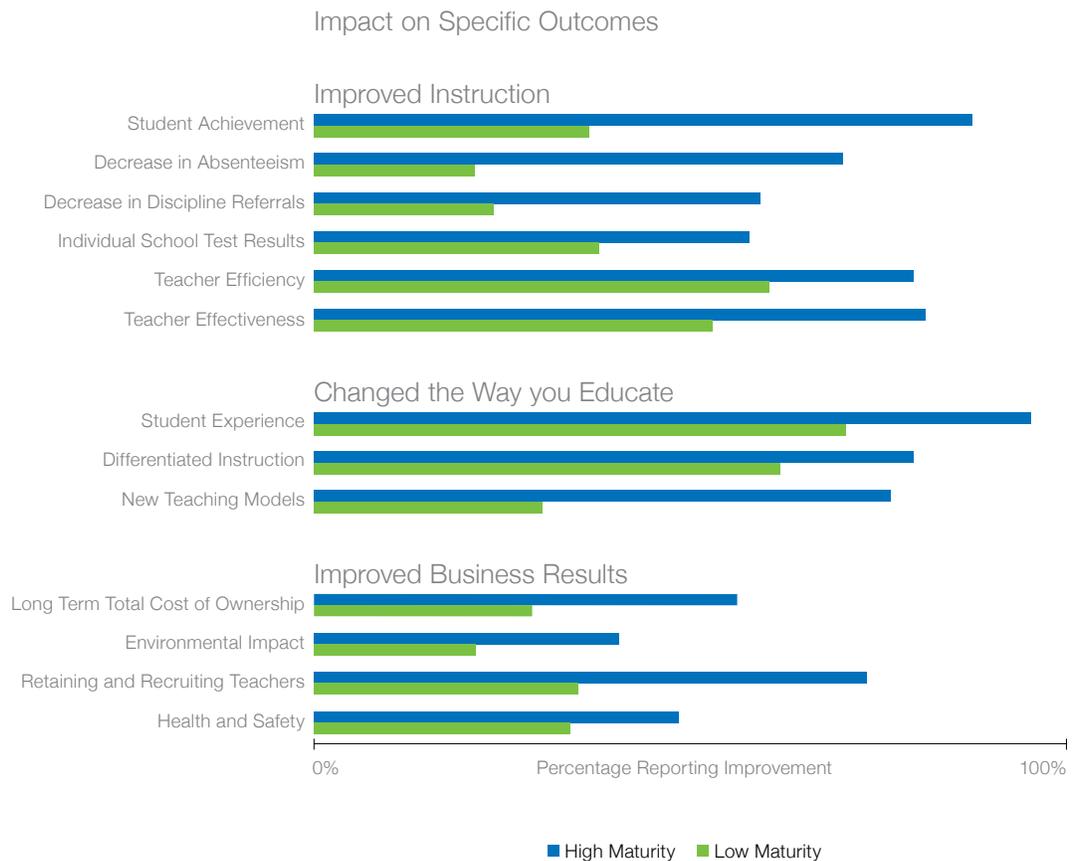
- Finally, low adoption of both provides the lowest value.

This relationship not only holds true for value; it also strongly relates to specific outcomes. The same effect can be found by relating the various combinations of adoption above with (a) positive change to the way you educate, (b) ability to provide differentiated instruction, and (c) ability to test and implement new teaching models (flipped classroom, etc.). Thus it is clear that the best way to drive value is through the combination and broad adoption/penetration of both technologies, which enables multiple instruction opportunities (e.g. flexible learning/grouping) and the most effective approach.

## Measured outcomes are positively impacted by the combination of technology and practices

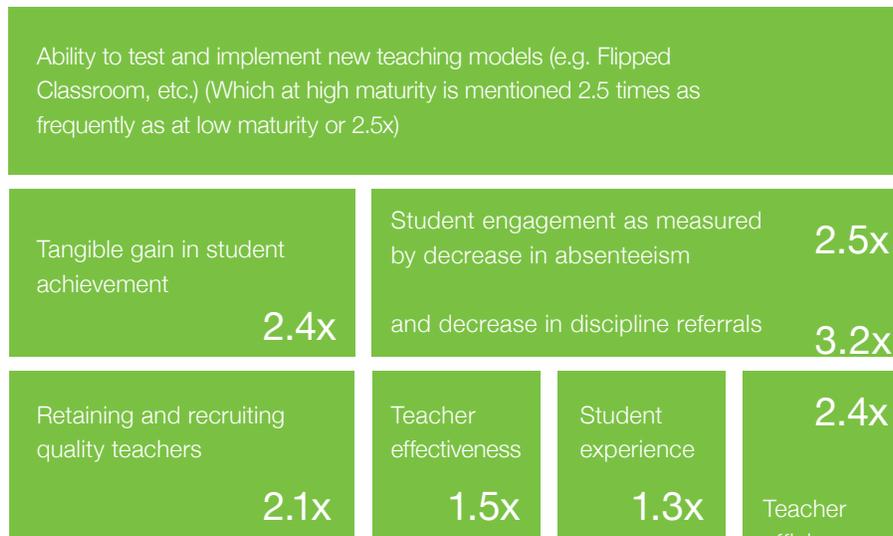
Our participants at the highest levels of maturity generally reported a high frequency of positive impact to their metrics, compared to the participants at the lowest level of maturity. The chart below displays the percentages of participants that reported positive impact to specific outcomes at high and low maturity levels due to their instructional technology investments.

Participants at the highest levels of maturity reported a high frequency of positive impact to their metrics, compared to the participants at the lowest level of maturity.



## High maturity levels frequently report positive impact

- Student achievement and student experience are most frequently positive at high maturity levels.
- At a high level it is clear that the respondents indicated that positive impact to instruction and positive changes to the way they educate were more frequent than positive impact on the business side.
- Some of the metrics are related to the participant's function in the organization. For example, administration is more likely to report positive impact to the business metrics.
- Metrics that are generally mentioned by all populations include:



Based on these findings it is clear that technology and practices enable a great deal. It shows positive results in student outcomes, which are important results from a teacher perspective. It also produces business results that every administrator or jurisdictional executive would love to achieve.

# Instructional technology best practices

The quantitative study measured the participant's level of performance on thirty-two best practices and the impact that the practices have on their organization's success. Practice performance and impact were evaluated on 10 point anchored analog scales.

For reporting purposes and clarity for participants, the practices were grouped into six dimensions:

Student collaboration, engagement and learning outcomes

Teacher efficiency and retention

Assessment for and of learning

Flexible/blended learning

Holistic system-wide practices

Successful implementation

# Overall most important practices

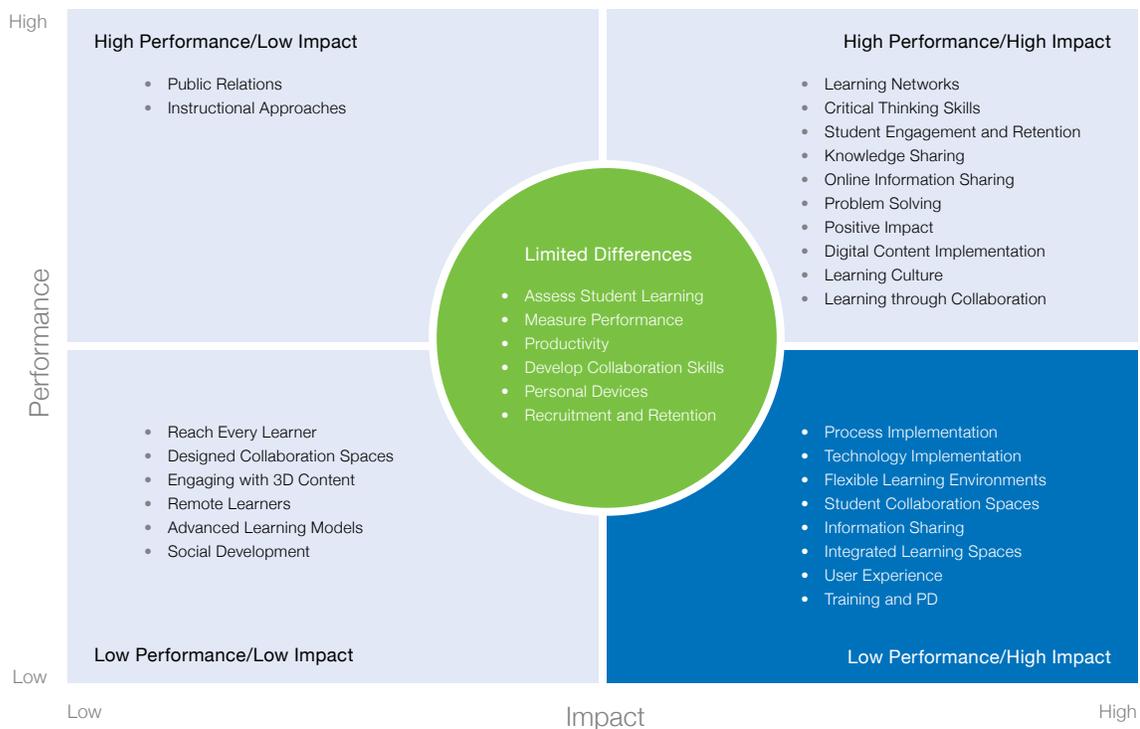
Of the 32 practices rated on a 1-10 scale, the highest scoring elements are: Learning through Collaboration, Learning Culture, Positive Impact through a sense of achievement or creativity, Problem Solving, Online Information Sharing, Digital Content Implementation and Knowledge Sharing. The lowest scored elements are Advanced Learning Models, Remote Learners and Social Development.

Overall top-rated best practices include:

- Learning through Collaboration
- Learning Culture
- Problem Solving
- Digital Content Implementation
- Information and Knowledge Sharing

The chart below is an analysis of the overall performance and impact of the practices grouped into four quadrants based on the relative relationship between performance and impact.

Relationship Between Performance and Impact



The key group in the quadrant analysis is represented by those practices that are particularly impactful and have low levels of performance. Typically, this type of analysis focuses effort on that quadrant.

Over 300 educators indicated these practices were important and had strong impact.

The focus practices include:

- **Process Implementation:** that completely addresses the process aspects of instructional technology (operation, integration, governance).
- **Technology Implementation:** that completely addresses the technology aspects of implementing instructional technology (sizing, infrastructure management, service management, integration, etc.).
- **Flexible Learning Environments:** approach that allows teachers to move seamlessly between whole-class instruction, small-group collaboration and individual learning.
- **Student Collaboration Spaces:** technology-enabled collaboration spaces are available wherever they are needed (classrooms, hallways and staff rooms) whenever students need to solve problems and build on their learning collaboratively.
- **Information Sharing:** instructional technology that allows information to be shared effectively across devices and applications seamlessly.
- **Integrated Learning Spaces:** defined (and delivered) range of learning environments with appropriate enabling technologies.
- **User Experience:** integrated technology with a consistent user interface facilitating user experience.
- **Training and Professional Development (PD):** collected training requirements and delivered a program that best meets the needs of teachers and students.

This is an immediate indication of things educators might look at in their organization. Over three hundred educators indicated that these were important and had strong impact. To find out key areas of focus for your jurisdiction, try the self-assessment at [smarttech.com/assessment21](https://smarttech.com/assessment21).

# Important best practices differences for a subset of the survey participants

Several demographic questions were asked in order to gain insight into the various job functions, types of organizations (e.g., K-12 vs. higher education), number of students the organization supports and the organization level (e.g., school vs. education jurisdiction). A broader description of the demographics is included in the section called “methodology”.

The following are the highlights from the comparison of practices at a demographic level:

Administrator top-rated best practices include:

- Teacher Recruitment and Retention
- Assess Student Learning
- Student Collaboration Spaces
- Process Implementation
- Measure Performance
- Information and Knowledge Sharing

- In general, administrators gave higher best practice ratings than teachers, and IT/Media specialists scored in-between. Specifically, administrators rated the following higher than teachers (differences are statistically significant):
  - Recruitment and Retention: ability to recruit and retain teaching staff.
  - Assess Student Learning: using interactive response systems to collect and act on feedback.
  - Student Collaboration Spaces: making technology-enabled spaces available to students as needed (classroom and elsewhere).
  - Process Implementation: addressing the process aspects of implementation.
  - Measure Performance: ability to collect measurable data on student performance.
- As a generalization, large organizations (those supporting more students) scored higher than small organizations. This is true for different sizes of schools as well as different sizes of jurisdictions (at a larger scale). The largest organization represented in the sample supported 39,000 students.
- Higher education scored higher than K-12 in about two thirds of the practices. Specifically, K-12 led the most in developing critical thinking skills and developing collaboration skills and lagged significantly on handling remote learners.

## Other important findings

### Technology adoption/penetration – general findings

The research study tested the adoption and penetration of 11 technologies/technology products in the survey. The table below contains the percentage of participants that reported low usage and those that reported high usage.

Interactive whiteboards, document cameras, sound amplification, collaboration software, content software, tutorials, games and search can generally be characterized as: ~1/3 are not in operational use, ~1/3 are in use with low adoption and ~1/3 are in use with high adoption.

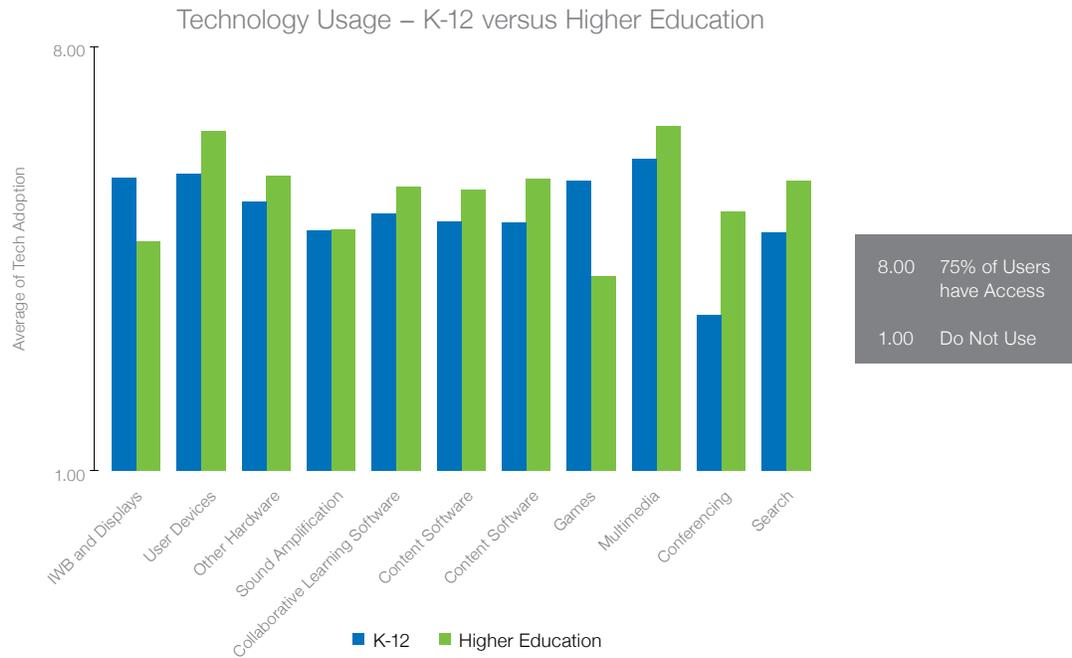
Only user devices, multimedia and conferencing are significantly different. It is possible that this is due to the simple ubiquity of user devices and multimedia software. There was a low result for conferencing, although as one might expect adoption is stronger in higher education than K-12.

### General Technology Usage

	Percentage	
	Not in Use	High Use (50%+)
Interactive Whiteboards and Displays	35%	36%
User Devices	19%	55%
Other Hardware (e.g. Document Cameras)	24%	34%
Sound Amplification	36%	29%
Collaborative Learning Software	30%	33%
Content/Lesson Creation Software	30%	34%
Tutorials	28%	36%
Instructional Games	30%	30%
Multimedia	16%	52%
Conferencing Software	49%	14%
Search Software	34%	35%

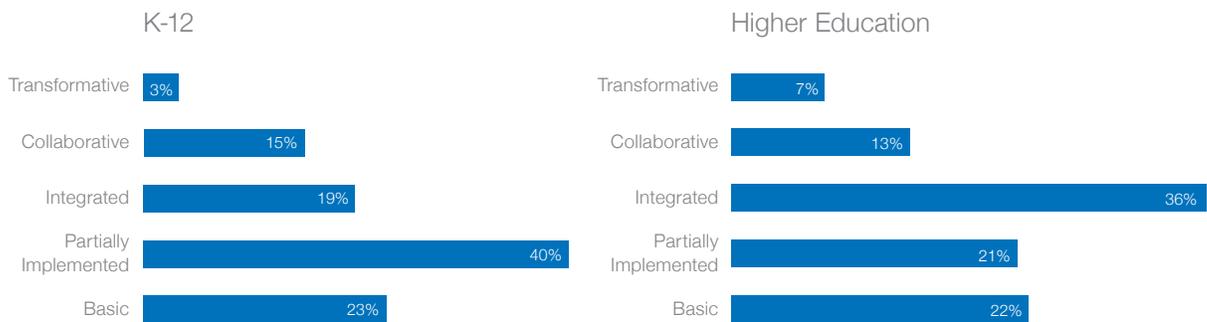
## Comparative technology usage

The chart below depicts the relative adoption of the technologies tested from K-12 versus higher education participants.



## K-12 and higher education maturity in best practices is considerably different

The chart below demonstrates the differences.



The analysis indicates that a fair number of higher education organizations have made the step from partially implemented to an integrated level of maturity in instructional technology. This difference is significant at the .158 level. The drivers appear to be in higher education's focus on remote learners, ad hoc collaboration spaces, critical thinking skills, problem solving and collaboration. Generally, we believe that at least the last few of these may be directly related to student age.

## Technology adoption and best practices – contribution to value

A relatively deep analysis was completed on estimating the relative contribution to value that technology and practices make. Value is directly related to the use of practices and technology. When organizations add more high-quality, integrated instructional technology and improve their practices with regard to instructional technology, they get dramatically better results – both in value and in specific outcomes. Outcomes (investment success, educational transformation and business metrics impacts) are also directly related to practices and technology.

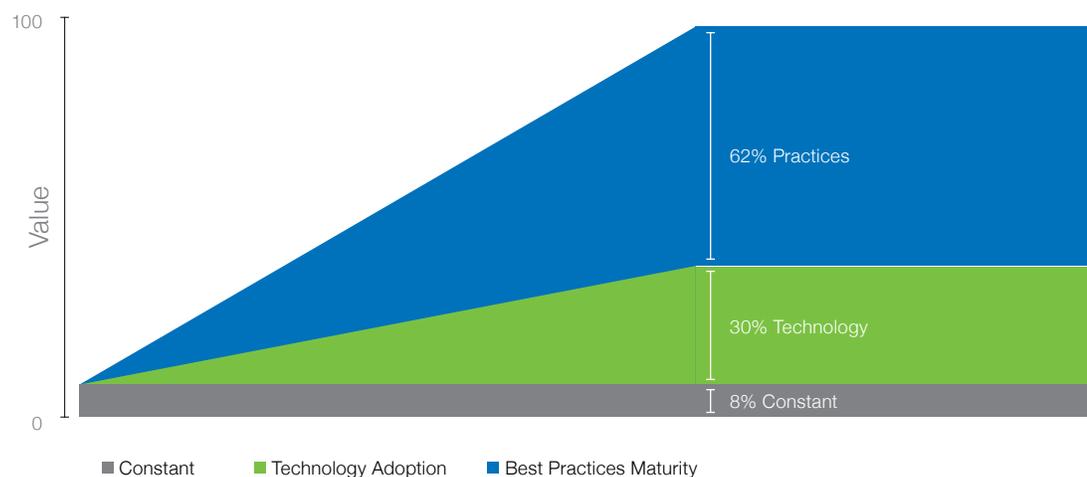
While most dramatic growth of value occurs between the partially integrated and integrated levels of maturity, all improvements drive value. Value is derived from almost every level of investment. Even initial investments in instructional technology add value.

Adding more high-quality, integrated instructional technology and improving instructional technology practices lead to dramatically better results.

There is a complex, non-linear and multidimensional relationship between the components of instructional technology, best practices and value. The analysis indicates that:

- At high level of maturity (which generally means significant adoption of technology and solid performance of practices) technology drives about 30% of the value achieved, best practices about 62% and the balance (8%) is from extraneous variables.
- There are some indications that the opposite mix (or an even mix) may be more effective at driving value at low levels of technology adoption and practices performance.

Best Practices Maturity and Value



This shows that a focus on technology without practices is likely to result in fairly low value. In a similar manner, a focus on practices without a solid level of technology usage is likely to result in less than optimal value. It also provides some indication of where educators should focus their organization's efforts in the maturity journey across the spectrum of instructional technology.

## Research summary

Using interactive whiteboards and personal devices together significantly improves outcomes and enables advanced learning models.

The connection of technology and practices with value is strong and positive.

The key findings include:

- Educational organizations are at different levels of maturity, with only a small number (5%) at the highest level of maturity.
- The connection of technology and practices with value is strong and positive.
- Interactive whiteboards and user devices in combination can drive significantly improved outcomes and enable advanced learning models.
- Measured outcomes are positively impacted by the combination of technology and practices.
- In general, instructional technology is a story of thirds: 1/3 have almost none, 1/3 have some and 1/3 have a significant amount.
- K-12 and higher education organizations are in considerably different places with regard to technology-enabled student collaboration.
- Both technology and practices contribute to value. At high levels of maturity more value is driven by practices and at low levels more value is driven by technology.

## Recommendations on what to do next

The recommendations that follow are based on a study of practice data clusters from the survey.

The cluster analysis defines a set of groups that maximize homogeneity within the group and heterogeneity between groups. The clusters represent groups of organizations that perform in a similar manner. The groups represent a snapshot of the status of best practices. They are useful as a means to compare the performance characteristics of organizations as they mature and to provide some insight into how others have progressed through the maturity levels.

## Getting started

Organizations just beginning the instructional technology journey to maturity should focus on establishing a clear technology strategy and plan, and a strategy for student collaboration in the school setting. They should engage in technology deployment and practice improvement (or initial development) in the following areas:

- Deploy interactive whiteboards as the base technology architecture. Make sure the selected devices will integrate with the next layers of technology that will be implemented (response devices and user devices). Make sure that the selected technology architecture is easy to use and learn, and positively impacts a sense of achievement, creativity and actualization both for students and staff.
- Implement instructional technology/collaborative learning software that helps to deliver interactive lessons that engage students, improve retention and boost student participation and collaboration. This software will be at the core of the technology implementation and usage, and needs careful consideration and selection. It should be easy to use by teachers and students, accessible to parents, and should be built to easily integrate complementary products that may be added to the technology suite in the classrooms over the coming years. This software will become the platform for teaching and learning in the school/jurisdiction and hence requires a selection process that is sound and rigorous.
- Establish a learning culture that enables the process of interaction, trust and openness, a desire to work with other people and engages students with each other to build a better understanding of concepts and problems.
- Build a learning community, and use the Internet as a platform to share and expand knowledge with students and parents.
- Content is the key. Use content from several sources to help drive high-quality lessons that enable learning objectives. This may include the technology provider's repositories, colleagues' shared work, etc. Make sure to take advantage of all the work already done by your peers.
- An emphasis on training and professional development for teachers is essential to ensure good adoption and to drive strong outcomes. Teachers need to be made comfortable with new technologies and practices that will allow them to leverage the benefits available and to broaden their perspectives on what is possible.

**Recommended first steps:**  
deploy interactive whiteboards, implement instructional software, establish a learning culture, build a learning community, use high-quality content and focus on training.

## Moving from low maturity to moderate maturity

At a low level of maturity there is probably a sound technology base established and the implementation of best practices has begun. The next phase of technology and practices involves:

- Continuing to focus on learning culture, learning through collaboration, building a knowledge sharing community and expanding that to learning networks and student engagement.
- At this stage, begin to lay the ground work for advanced learning models and flexible learning environments. This involves making technology selections and implementing user devices to support interactive whiteboard and user device interactions.
- Implement interactive response devices to support student assessment. Driving to flexible learning requires real-time, fact-based formative and summative assessment of student learning that will allow effective student grouping, and help pace and differentiate instruction at both an individual and group level. Learn how to effectively use the technology feedback loop that assessment provides.

Begin to lay the ground work for advanced learning models and flexible learning environments.

## Moving from moderate to high maturity

At this point in the maturity model there is a solid understanding of instructional technology. There is a great deal of technology in place and it's beginning to be used in an integrated manner. The practices have developed to the point where a number of approaches can be executed and solid feedback can be obtained. The next step is to escalate the approach.

- Change the focus from instructional technology to collaborative learning in every situation possible. Effective collaboration and the ability to produce work that is built collaboratively is a critical requirement in business. Help prepare students for the 21<sup>st</sup> century workforce.
- Continue the focus on learning culture, community and student engagement. Add to that a strong focus on using the available integrated technology to collaborate.
- Implement practices that support productivity and continue to drive student outcomes in the areas of critical thinking, problem solving and social learning.

Change the focus from instructional technology to collaborative learning.

## Moving from high maturity to full transformation

Organizations at this level are not alone, but they certainly are leaders. These organizations should share successes and collaborate, and should focus on the following:

- Prepare students for a future as collaborators. Improve the capabilities that will make them successful in the 21<sup>st</sup> century. Teach them to effectively leverage each other's capabilities and to accomplish a common goal.
- At this stage balanced performance is necessary so focus should not be limited to any specific best practice. Execute all of them with excellence. Invent some new practices that have been shown to be important and share them.

Prepare students  
for success as  
future collaborators.

## Next steps and further research

To help administrators, teachers and public officials involved in education to leverage this research, an online self-assessment has been made available. If you are interested in assessing your school or jurisdiction, SMART's self-assessment tool is available at [smarttech.com/assessment21](https://smarttech.com/assessment21).

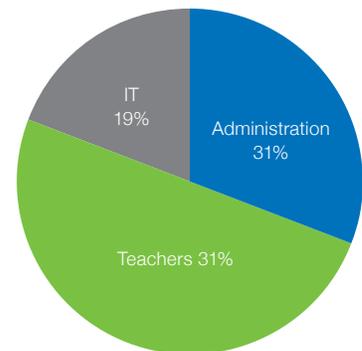
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# Research methodology and demographics

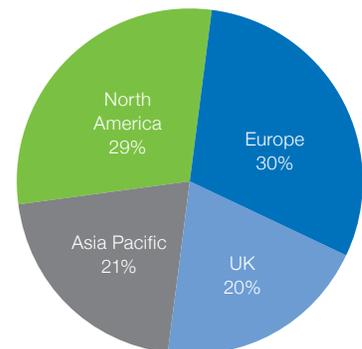
The research study was conducted by Filigree Consulting and entailed the collaborative development of objectives, hypotheses, instrumentation and synthesis of the research results. A panel approach was used for the majority of the data collection. More than 350 observations were collected. After filtering to remove outliers and incomplete records, 319 responses were used in the analysis.

The study was based on a broad global sample with good representation of both end users and decision-makers representing universities, as well as secondary and primary schools, larger education jurisdictions and individual schools, and a wide variety of different sized organizations. The following charts depict the demographics of the sample:

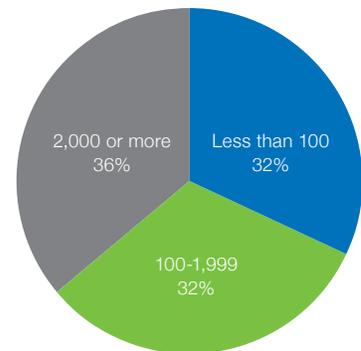
- **Job Function:** of the 319 participants in the sample, 100 were from administration, 158 were in teaching or instruction jobs and 61 were from IT/technical or media specialist jobs.



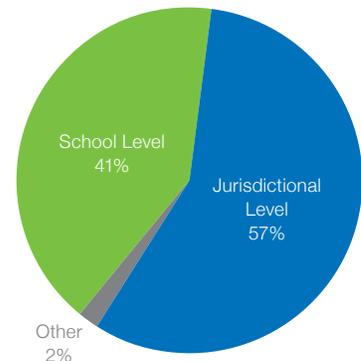
- **Region:** the global geographic distribution of the sample was as follows. North America was 29% of the sample (92% of that from the USA). 21% of the sample was from Asia (China, India, Australia and Russia). Europe was 30% (about 55% from Western Europe). The UK represented 20% of the sample. The UK was broken out of the European (France, Germany and Italy) responses in the analysis due to substantial differences between the UK and the rest of Europe in particular in practices performance.



- Number of Students Supported:** a broad distribution of different sized organizations participated in the study, from individual teachers with 40 students to fairly large jurisdictions with 39,000 students. Raw numbers were obtained in order to classify them into the simple model represented at the right for presentation purposes.



- Organizational Level:** The majority of the participants described themselves as either in schools (41%) or in jurisdictions (57%). While there was a small group of “other” collected, further classification was not possible.



- Organizational Type:** 35% of the participants represented higher education organizations and 50% represented K-12. The group denoted as “other” represents a combination of large organizations with administrative responsibility (potentially Ministries of Education), other education administrators that did not associate themselves with a specific school type, and a small group that simply responded as other. Unfortunately, the counts of the individual organization types prohibit analysis at a more granular level.

