The Impacts of Active Learning on Learning Disabled Students

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Abstract
One of the most important best practices in education is active learning. Earlier this year, the White House Office of Science and Technology Policy issued a national Call to Action aimed at improving STEM education through the use of active learning. Active learning serves to clarify, and solidify the material presented in the lecture as well as to help the students retain the information presented in the class. It involves activities generally performed in class. A typical active learning process involves the instructor first lecturing on new material immediately followed by an active learning activity related to this material. While these methods are shown to improve the quality of education, it can have a negative impact on learning disabled (LD) students. Depending on how the activity is administered, it may require the student to absorb and understand a minimal amount of the material from the lecture part in order to participate in the active leaning activity. This can present a problem for learning disabled students. While there are many types of accommodations that can help an LD student, one common characteristic most all LD students have is that they require more time to assimilate any newly presented material. This can present a problem if the active learning activity is immediately following the lecture. For example, the minute paper activity requires the student to write on the topic just covered for one minute. Then present or otherwise submit the writing perhaps for a grade. A learning disabled student may not be able to acquire sufficient knowledge from the lecture part, in the time given, to be in a position to write such a piece. Furthermore, the process of writing itself may present additional problems as many types of learning disabilities impact writing.

In addition to effecting the student's grade, it has the potential to isolate the student from the class. A student that cannot perform or contribute to group activities will soon develop a negative reputation and get isolated from the other students. This effect may also push the student out of the class and perhaps out of the major. The number of students effected is significant. According to the U.S. Department of Education, one can expect, on average, that between 3 to 4 percent of the student body in a typical class will have some type of documented learning disability and many more undocumented.

This paper investigates the different active learning techniques and presents the potential problems with each one. Possible alternatives or modifications to certain active learning activities are presented where possible. The author of this paper has a severe case of dyslexia and is an Assistant Professor of software engineering and can see the problem through both, the eyes of the student and the eyes of the instructor.

1 Introduction

One of the most important best practices in education is active learning. Last year, the White House Office of Science and Technology Policy issued a national Call to Action aimed at improving STEM education through the use of active learning. Active learning serves to clarify, and solidify the material presented in the lecture as well as to help the students retain the information presented in the class. It involves activities generally performed in class. A typical active learning process involves the instructor first lecturing on new material immediately followed by an active learning activity related to this material. While these methods are shown to

improve the quality of education, it can have a negative impact on learning disabled (LD) students.

This paper is not a formal or extensive study of this problem but rather its focus is just to provide awareness to those who practice active learning. This paper presents some of the challenges a student with a learning disability may have with some parts of active learning activities. The author does not discourage the use of active learning but rather encourages activities that are inclusive to all students including those with learning disabilities. This paper investigates a few active learning techniques and presents some potential problems with each one. Alternatives or modifications to certain active learning activities are presented where possible. The author of this paper has a severe case of dyslexia, is an Assistant Professor of Software Engineering, and can see the problem through both, the eyes of the student and the eyes of the instructor.

2 The Problem Addressed

There are many potential problems with active learning techniques but the most predominant is with the constraints imposed on the student's ability to learn fast. Depending on how the activity is administered, it may require the student to absorb and understand a minimal amount of the material from the lecture part in order to participate in the active leaning activity. This can present a problem for learning disabled students. While there are many types of accommodations that can help an LD student, one common characteristic most all LD students have is that they require more time to assimilate any newly presented material. This can present a problem if the active learning activity is immediately following the lecture. For example, the minute paper activity requires the student to write on the topic just covered for one minute. Then present or otherwise submit the writing. A learning disabled student may not be able to acquire sufficient knowledge from the lecture part, in the time given, to be in a position to write such a piece. Another potential problem is with the performance during the activity. If a student is registered with the proper office to receive accommodations, then these accommodations must be provided to the student during these in class activities. Typical accommodations includes extra time to complete the activity and a quiet place to perform the work. Furthermore, the process of writing itself may present additional problems as many types of learning disabilities affect writing.

The underlying problem is that the activity may impose constraints on the student's learning process. Research on active learning techniques assumes a typical student. While there is variation in how students learn, this variation is within tolerance for students without a learning disability, allowing these activities to work properly. In contrast, learning-disabled students have a large variation in the methods they use to learn and therefore one will never find a "one size fits all" technique that works for all of them. Even something like graded homework can add a constraint. I had a class where the time it took me to complete the homework kept me from spending time on understanding the concepts behind the material. Therefore, I decided to remove that constraint and spend all my time solely on reviewing my notes and understanding the concepts. I lost a letter grade by not turning in my homework but my test scores placed me near the top of my class since I was able to understand the concepts, which helped me with the rest of my education. Since the person who best knows how they learn is the student himself or herself, it is important that we give these students some freedom to adapt their learning process.

Not being able to participate in these activities may result in a lower grade if the activity is graded. However, while it is true that these activities are generally not graded, the most

damaging part of an inability to participate is the loss of one's reputation, with both, the other students and the instructor. The image that one portrays by not having the knowledge other students have at the time of the activity is that of a weak or perhaps a lazy student. It is very awkward to be in a group of three or four students tasked to perform some activity and one has to just sit there without the knowledge of the material or even an understanding of the activity itself. Then, if that was not bad enough, imagine that they select you to present the findings to the class since you were inactive in the activity, and now you are presenting something you do not have a clue about, making a fool of yourself to the whole class. This may be a bit of an exaggeration but hopefully the idea is being conveyed.

In addition to the potential of effecting the student's grade and reputation, it also has the potential to isolate the student from the class. This effect may push the student out of the class and perhaps out of the major. The number of students effected is significant. According to the U.S. Department of Education, one can expect on average between 3 to 4 percent of the student body in a typical class will have some type of documented specific learning disability (SLD) and many more undocumented.

Once the learning-disabled students graduate and find jobs, they will be faced with on the job training that may be in a formal classroom setting employing active learning. For workplace training, the damage to the employee's reputation may be more significant than that of a full time student. One's reputation is not just a matter of pride, but rather an essential asset needed for promotion and advancement. Furthermore, unlike in school, the learning-disabled employees are very unlikely going to reveal their disability to the employer. On the good side, these students have more experience learning and generally have a better understanding of how they learn. Therefore, the benefit of giving them flexibility is greater in the workplace than in school. Overall, from my years of experience as a student and an employee, I strongly believe that it is much more difficult being an employee with a learning disability than being a student with a learning disability.

3 Understanding the Leaning Disabled Student

The following section describes the different types of learning disabilities and their typical accommodations.

3.1 Types of Learning Disabilities and Related Deficits

According to the Individuals with Disabilities Education Act[1,4] (IDEA) which refers to this type of disability as a specific learning disability (SLD), A SLD is "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations." Learning disabilities typically include dyslexia, dyscalculia, and dysgraphia, and are typically also present with other types of deficits such as visual and auditory processing deficits, non-verbal learning disabilities, executive functioning deficits, attention deficit/hyperactivity disorder (ADHD) and others[3.1]. In a separate source from the University of Washington's DO-IT (Disabilities, Opportunities, Internetworking, and Technology)[5] program, they list the impacts of learning disabilities as spoken language which includes listening and speaking, written language including reading, writing, and spelling, arithmetic including both calculations and mathematical concepts, and reasoning including organization and integration of ideas and thoughts. This source also presents functional

limitations that may present themselves in learning disabled students. They include auditory perception and processing, visual perception and processing, information processing speeds, abstract reasoning, short and long term memory, spoken and written language, mathematical calculations, and executive functioning such as planning and time management. A typical leaning disabled student may have more than one such limitations. They may actually have many of them such as myself, which have about half of them to some degree.

In the 2016 report from the National Center for Education Statistics (NCES) part of the U.S. Department of Education[6] , 11% of undergraduate students had some type of disability and in the 2011 NCES report[7] 31% of those disabilities being a SLD. This results in about 3% to 4% of the students in a typical class may have some type of SLD and require accommodations to succeed.

3.2 Typical Accommodations Used by Learning Disabled Students

While learning disability effects each student differently, they all have certain characteristic in common. First, they generally need extra time on exams or activities[5]. This extra time may be anywhere from 50% additional time, double time or even more. This accommodation may be to compensate for the extra time it takes them to understand the problem, to actually perform the solution, or even perhaps to take extra time to formulate and express their answer. It may be to allow conversations with a reader or some other assistant. Regardless, extra time seems to be a common accommodation. Another common accommodation is that they need to take exams in an isolated and quiet environment[5]. It is also common that the learning-disabled student require the help of a tutor, outside of class, to understand the material in class before they are in a position to work out any problems or to be tested in any way. The use of in-class note takers and voice recorders are common tools used by learning disables students[5]. These are all very common types of accommodations. I, for example, required all these accommodations, excluding the in-class note takers and voice recorders, when I was a student.

4 Identifying and Managing Constrains in Active Learning

The following sections describes some of the constraints active learning techniques may impose on the student, and what changes can be made to make them more inclusive. To demonstrate how a method can be modified, a sample list of active learning methods is presented, along with their problems and possible solutions. The goal of this section is to learn how to identify the constraints and how to manage them to provide a more inclusive learning environment where all the students can benefit from the active learning activities. Managing the constraints does not imply removing them as learning disabled students also need to learn how to deal with them. A balance must be reached where the students can learn the course material and how to deal with constraints.

4.1 Constraints Active Learning Imposes on Learning Disabled Students

Active learning may involve in-class activities. These activities may require the student to understand the material just covered in class. It may also require the student to participate in an in-class activity that is generally timed. Some activities require the students to have relevant conversations with other students. Many activities require the student to perform some task in class which is not considered a quiet and isolated environment. Since every student is different, it is not always obvious what aspect of the active learning activity will cause difficulty to such a student.

The following is a list of some of the constraints associated with active learning that can become problematic to the learning disabled.

1. **Constraint on the time allowed to absorb material before an activity.** Activities performed immediately after the associated material is presented. Learning disabled students may need extra time to understand and make sense of the material before they are in a position to perform a related activity. A learning-disabled student may not have been able to understand the material as they are expected to or like the other students have, and will perform poorly on the activity. Sometimes the LD student may require the use of an assistant, such as a tutor, to help them understand the material. One solution is to perform the activity first thing during the next class. This gives the LD student the time to process the information. This is not a complete solution, as the student may need the help of a tutor. If the class is on a Tuesday, for example, and the next class on a Thursday, then the tutor will have to work with the student during that short time frame and may result in a scheduling issue. Furthermore, the activity may need to be performed immediately after the material is presented for it to be effective.

2. **Constraint on the time to complete the activity. Learning disabled student may need** extra time, perhaps as much as double time, to perform an activity. In the event of an exam, the student may take the exam at a testing center at a different start and end time as the rest of the class. However since these activities are generally performed in class, the learning-disabled student will need to keep up with the class or the class will need to stop and wait for the student to finish. One solution is to allow all students extra time, but this may result in the other student using the extra time to improve their results. One can argue that this is not fair to the learning-disabled student. Furthermore allowing all students extra time will reduce the number of activities that the instructor can give. Another solution may be to allow only the learning-disabled student to take extra time and the rest of the class continues. This has two problems. First, the learning-disabled student will be identified to the other students and this can be a violation of the student's confidentiality. Secondly, the learning-disabled student will miss the beginning of the next activity or lecture, which may result in even more of a challenge to the student. Finally, the activities of the rest of the class and instructor may be distracting to the student still working on the previous activity.

3. **Constraint on the environment to perform the activities.** For activities that are performed in-class. Learning disabled students may need to perform the activities in a quiet and isolated place. Most universities have a testing center reserved for disabled students who need extra time or a quiet and isolated place to take exams. A classroom, even with other students quietly working on their activity, may not satisfy these accommodation requirements. They may be distracting to the learning-disabled student. Without identifying these effected students to the rest of the class, it is difficult to overcome this conflict.

4. **Constraints on the use of assistive technology.** For activities that require the student to produce written material in class, the student may rely on technology or an assistant to help them produce written material that is comprehendible to a reader. For example a

spell and grammar checker or an assistant that reads the material, asks questions to understand it, then rewrites or suggest corrections to the text. An in-class activity may not lend itself to such accommodations.

5. **Constraints on communication venues.** Some active learning activities require the students to interact with each other and have conversations at a much higher level than what you will need for simple socializing. This can be a challenge to a learning-disabled student who has trouble understanding verbal conversation or has trouble generating a response in real time. These students may have trouble understanding the other students and can have trouble expressing their ideas verbally.

6. **Constraints on recording options.** Applies to activities that do not lend themselves to note taking or voice recording. Most activities where the students perform a task do not lend themselves to note taking. The student or a note taker will not be able to describe the results of the activities on paper. Similarly recording voice while students work on their activity may not lead to a recording that will provide any use. The problem is that in these cases the student cannot absorb the material in class and relies on their notes or voice recording to create a record of the material presented for later use. After the student has a chance to digest the material and make sense of it, then the record of the activity may be useful to some extent. However, if the record is useless, then the student may not be able to recall the activity and learn from it.

This list is not exhaustive and only serves the purpose to illustrate how active learning techniques can add constraints to the learning process and how the instructor can identify these, and other constraints.

4.2 Constraint Management

The following is a list of recommendations to formulating a solution to managing constraints.

1. Avoid simply removing the activity altogether as they are effective to all the other students and can be made effective to the learning-disabled students as well. Learning disabled students need to develop coping skills that they will use in later in the workplace.
2. Never isolate a learning-disabled student or treat them differently. Never give them a different activity or allow them to skip the activity. All modifications made to an activity must apply to all students equally. Learning disabled students needs to learn how to work within the constraints that are in place. They will not receive special treatment or accommodations in the workplace and needs to learn how to survive in such an environment.
3. Do not delay class progress to wait for an excessively slow student. That will place the burden on the slow student and, besides being unfair to the others, may create animosity.
4. Do not sacrifice class material in order to develop coping skills. Even though the learning disabled students need to learn how to cope with constraints, the activity must still allow the students to learn the course material. The learning-disabled students need to grow their coping skills over time while keeping up with the class material.

The goal is to allow the learning-disabled students, or all students for that matter, to participate as much as they can. Give the students an opportunity to find a coping strategy that works for them. The instructor may suggest a coping strategy.

4.3 Sample Active Learning Methods, their Constraints, and their Modifications

The following is a list of active learning activities used to illustrate the constraints presented above and possible solutions. This list was partially gathered from the University of North Carolina's Center for Faculty Excellence[8].

1. **Think/Write Pair-Share**[9]. This activity involves posing a problem to the class and giving the students about 1 minute to formulate a response. Then the students form pairs and they talk about each other's response. For example, the instructor may give a numerical algorithm to solve a math problem and ask why its error is considered second order. This is a timed activity and also may require the students to absorb some of the material in class immediately before the activity. When paired up with another student, a learning-disabled student that was not able to formulate a response in the time provided, may not have anything to talk about and the activity may not work for either student. In addition, the learning-disabled student may develop a reputation for being incompetent. A student who does not fully understand his or her own disability may develop a low self-esteem as a result. One solution is to allocate extra time, like 2 or 3 minutes, to allow the learning-disabled student time to understand the problem and formulate a response. In addition, the instructor may pose the problem or problems at the end of the previous class so the students have a chance to absorb the material and formulate some ideas before the next class.

2. **Buzz-Groups**[10]. In this activity, the instructor presents an issue and then form groups of 5 to 8 students and asks them to talk about the issue. Every member of the team is to contribute at least one idea. Then after about 10 minutes, the instructor calls on some of the teams to present their ideas. For example, an instructor teaching computer organization may present a computer processor that uses a pipeline scheme and ask the students why it needs three stall states to produce correct results. This has the same type of problems that result from the learning-disabled student having to understand the issue and come up with an idea in real time like the other students. This activity can be modified by not requiring each student in the team to formulate an idea. The students can instead discuss ideas and agree on a single idea, which they will then present. If the learning disabled does not feel prepared, that student can choose not to take the lead and contribute only as much as he or she can. In addition, the learning-disabled student can think about the issue and the idea while the other team members formulate theirs. That is, being last in the team to talk. This can give the learning-disabled student extra time. The noise environment may help the learning-disabled student learn to stay focused in such environments.

3. **The Lecture Check**[11]. In this method, the instructor lectures for about 20 minutes. Then poses a question, such as a multiple-choice question, and asks the students to raise their hand if the think 'a' is the correct answer. Then the same for 'b' and so on. If a large percentage of the class answers incorrectly then the instructor asks the students who answered correctly to turn to their neighbor and explain or convince them of the correct

answer. An easy solution is for the instructor to allow any student that does not feel prepared to not answer without penalty or singling them out. This way the learning-disabled students can participate as much as they can without penalty for falling short. If a neighboring student explains the correct answer to a learning-disabled student that is having trouble understanding, he or she can say "I kind of understand and will study it further later" to allow the class to move on. The instructor can terminate the activity and move on after a set time regardless of how the students understand the other student's explanation avoiding holding up the class.

4. **Classroom Assessment Techniques**[12]. This method involves pre and post class assessments. The assessments are short and performed in class. This method involves short writings but in engineering, this may involve a small quiz. This method can work well with learning-disabled students if the assessment activities are performed out of class such as before and after class. The use of a course management system can facilitate such out of class assessments. The instructor can allow the students eligible for accommodations to take the quiz at a later time to allow them to absorb the material first.

5. **Challenge Based Instruction**[13]. This is a type of inquiry-based instruction where the instructor provides a lecture to give the students the knowledge they need for the activity, then the instructor poses a challenge and asks the students to come up with solutions that can solve the challenge. As the students present their ideas, the instructor guides them towards the correct solution. This is my preferred active learning method to use in engineering classes because it is very effective and allows for different levels of participation provided the instructor does not call on specific students. Students that do not volunteer a solution can still follow the reasoning for other student's solutions and benefit from the activity. Even though the activity requires the students to understand the material the instructor lectured immediately before, the less detailed solutions offered by the students could help a learning-disabled student understand the lecture, at least sufficiently well to benefit from the activity.

6. **Flipped Classroom** This method is different in that it is not an actual activity but rather it creates class time for activities. Therefore, how suitable this method is to learning-disabled students depends on the activities performed in the class. The method works by using the class time for activities rather than for lecture. The student are instructed to review the lecture material before class usually by some type of assignment. Modifying this method to accommodate the learning disabled can be tricky because you are not just adding activities to the class but also removing lecture. In the previous methods presented, even if the student was unable to gain from the activities, the lectures are still there. For abled students, it is assumed that they can learn the material before class sufficiently well to perform in the activities, although not as well as with a lecture, and then the in class activities more than compensates leaving them with a net gain. The variable is in the activities. For learning-disabled students this assumption may not hold and now there are two variables. In the worst case, if the learning-disabled student is unable to gain anything from the activities, then they would have given up the lectures for something useless to them and they have a net loss. In the best case, the student prefers to learn out of class and is able to gain from the activities as well. The best approach is to

increase the likelihood that the learning-disabled students will actually gain from the pre-class material by providing strong learning material, not just point them to the book. Preferably, this material will include several modes of learning. For example, an instructor can provide audio/visual material by using prerecorded lectures perhaps using a smartboard for annotations, reading material from carefully designed handouts, and active material using interactive software products.

The list above is just a small sample of all the possible active learning methods that are used in practice. The idea to take from this list is not the particular problems and possible solutions, but rather, to understand that these methods can discriminate against learning disabled students and it is up to the instructor to recognize these potential problems, identify the issues and design modifications.

5 A Learning Disabled Student's Perspective

The following is a discussion of active learning techniques from the point of view of the learning-disabled student and what those students can do to survive. Active learning activities tend to be problematic for students that have a specific learning disability such as dyslexia, dyscalculia, and dysgraphia and whose learning disability is severe enough to require accommodations to succeed. Focus in this paper is to those cases where the learning disability is such that the student cannot benefit from the active learning activity and needs to find a way to cope and survive the class in spite of these activities. I fall into this category. From my point of view, I generally do not benefit from these activities and I do not like to hold the class back for my sake by asking many questions. I personally benefit the most from simple, old fashion lectures even though I do not understand them at the time the instructor is lecturing. I take notes and make sense of them later.

One method that I practiced extensively is to simply get by without notice. That is, my goal with these in-class activities is to get by without causing a distraction or holding up the class from moving forward. I also do not want to identify myself as incompetent to the other students or the instructor. If the instructor is the type that likes to call on students, then I will sit in the back of the class or somewhere less visible. I normally sit at the front row. I will not make eye contact with the instructor when he/she is searching for someone to call on. If the instructor is holding up the class trying to explain something to me, I nod my head as though I understand and in agreement, so that the instructor continues. If I have not had a chance to make sense of the material the instructor is trying to explain to me, then it is pointless for the instructor to try to make me understand during class. I first need to absorb and digest the material before I can benefit from direct conversations with the instructor. Once I understand the material sufficiently well to benefit from help from the instructor, I request direct help during the instructor's office hours. Unfortunately for myself, and I assume for many learning disabled students, the goal of in-class activities is to get by with minimal damage to one's reputation and disruption to the class. Learning is not priority.

6 Conclusions and Future Work

This paper presents some of the challenges a student with a learning disability may have with some parts of active learning activities. This paper is not to discourage the use of active learning but rather is focused on awareness of the impact these methods may have on the learning-

disabled students. In summary, active learning activities may present the following problems to the learning-disabled student:

- if the activity is performed immediately after the material is presented, the student may not have time to absorb the material before the activity,
- if the activity is timed, the student may not be able to complete the activity in the time given,
- if the activity is to be done in class, the student may not be able to work in the distractive class environment,
- if the activity involves the student expressing their work, the student may not be able to express their thought and ideas verbally or written, and
- if the student depends on notes or recordings, the student may not be able to record the event for later processing.

Five active learning techniques are presented along with the problems each may have with learning disabled students. In each case, a suggested modification is presented.

The paper also presents a list of guidelines for modifying the activities that instructors can follow. They include the following.

- Avoid simply removing the activity altogether as they are effective to all the other students and can be made effective to the learning-disabled students as well.
- Never isolate a learning-disabled student or treat them differently. Never give them a different activity or allow them to skip the activity. All modifications made to an activity must apply to all students equally.
- Do not delay class progress to wait for a student that is excessively slow.
- Even though the learning disabled students need to learn how to cope with constraints, the activities must still allow the students to learn the course material.

A formal study of this issue will allow the activities to be made inclusive to all students without the individual instructors needing to redesign them. It can also spread awareness to the educators. The following challenges will need to be addressed.

Since there are such vast difference between different learning-disabled students, a formal study will have to involve a large number of such learning-disabled students. Since only about 4% to 5% of the student population have a learning disability, such a study will require a large number of classes. It will be necessary to include many universities in order to have a large number of courses in which to gather data. Then one will need consent from the students as required by the Institutional Review Board (IRB). Given their disability, this will eliminate many students thereby increasing the number of courses required for the study even more. Then there is the quality of the results. Since each activity may be performed slightly different depending on the instructor, this can produce bad data. For example, consider the Minute Paper[1,2] activity where the students need to write for one minute. If during the activity the instructor leaves to get coffee and returns after 2 minutes, then the results may indicate there is no problem as the learning-disabled student actually had double time. Alternatively, maybe the activity is simple and only takes an abled student 30 seconds. The learning-disabled student will take the whole minute and complete the activity with no problem. Bad data can lead to the conclusion that there are no issues with active learning making the situation it even worst for the learning disabled. Then

there is the issue of what data do we need. What assessment data do we need that we cannot find using our common sense? Consider the student who has a learning disability and is entitled to double time on exams. When encountered with a graded Minute Paper activity, he is going to need two minutes. If this student is only given one minute, then it is not going to work regardless of what any future study may say simply because it violates the student's right to accommodations. However, if the activity is not graded and a modification is made, then we do need assessment data to measure its effectiveness.

Assessment data is needed to measure the effectiveness of a change. In the Minute Paper example, if the student's accommodation calls for double time, then giving that student two minutes instead may still not work due to other issues involved in the activity. If the assessment data show such a student really will need 3 minutes, then that is useful information.

There does not seem to be any research being performed or performed in the past addressing these issues. Therefore, it is a wide-open area.

7 References

1. Wilson, Robert C., "Improving Faculty Teaching: Effective Use of Student Evaluations and Consultants." Journal of Higher Education 57 (2): 196-211, 1986.
2. Richard G. Holtzman, "Adapting the one-minute paper for active learning," Academic Exchange Quarterly, 2007.
3. http://idea.ed.gov/explore
4. The State of Learning Disabilities, 3rd edition, 2013, National Center for Learning Disabilities.
5. "Academic accommodations for students with learning disabilities," Disabilities, Opportunities, Internetworking, and Technology (DO-IT), University of Washington, 2012.
6. U.S. Department of Education, National Center for Education Statistics, 2016.
7. U.S. Department of Education, National Center for Education Statistics, 2011, Table 4.
8. "For your consideration… suggestions and reflections on teaching and learning," University of North Carolina Center for Faculty Excellence, Nov. 2009.
9. Lyman, F. T. (1992). Think-Pair-Share, Thinktrix, Thinklinks, and weird facts: An interactive system for cooperative learning. In N. Davidson & T. Worsham (Eds.), Enhancing Thinking Through Cooperative Learning (pp. 169–181). New York: Teachers College Press.
10. McKeachie, W. J., & Svinicki, M. (2006). McKeachie's teaching tips: Strategies, Research, and Theory for College and University Teachers (12th ed.). Boston, MA: Houghton Mifflin.
11. Mazur, E. (1997). Peer instruction: A user's manual. Upper Saddle River, NJ: Prentice Hall Publishing.
12. Angelo, T. A., & Cross, P. K. (1993). Classroom assessment techniques: A handbook for college teachers (2nd Ed.). San Francisco, CA: Jossey-Bass.
13. Stacy S. Klein, Alene H. Harris, "A user's guide to the legacy cycle," Journal of Education and Human Development, Vol. 1, Issue 1, 2007.