

# Instructional Technology in Physical Therapy Education

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## EXECUTIVE SUMMARY

Instructional technology and student achievement have been a controversial topic in previous research. Previous literature has questioned the effectiveness of simply a delivery method for student outcomes (Clark, 1983). However, other variables such as a student connection to the learning method delivery and the type of instruction must be considered. Improper research design and misinterpreted assumptions in past research has led to misguided conclusions. Replicable student outcomes are difficult to accomplish when only sufficient content is included versus

necessary design content. Mastery of lecture material and psychomotor skill acquisition pose a growing problem for higher level decision making in programs such as physical therapy. The purpose of this paper is to discuss media or educational technology and its relation to student achievement in physical therapy education. In conclusion, delivery method in and of itself may not provide enough insight into replicable design, but rather how the type of instruction and the learner connection to the medium should be considered. Flipped classroom formats may pose some benefit for physical therapy educators to incorporate the use of combined traditional formats and technology to promote classroom efficiency for higher level thinking and psychomotor skill acquisition. Further research is needed to validate delivery method as a means for student outcomes.



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## INTRODUCTION

Educational achievement may be perceived as the instructor or student's ability to convey a message. How each instructor provides the assistance for knowledge attainment varies from classroom to classroom and may depend on teacher philosophical orientation and curriculum development. Methods for instructional delivery continue to grow because of technological advancement. However, does the instructional medium influence student achievement? The reader cannot dismiss previous literature that has questioned the

use of media and learning. These arguments date back to 1983 with Richard Clark's proposition that evidence cannot confirm the delivery method being the source of student success versus the content of the material presented (Clark, 1983). Rather other variables or considerations may provide the educational influence versus the medium applied for instruction. Physical therapy educators are provided the challenging task to meet evolving health care standards, tackling didactic lecture content and mastering psychomotor skills. The efficient use of time between instructor and student become invaluable.

As mentioned, the longstanding debate regarding achievement and medium selection can be dated back to Richard Clark's work in 1983 where he concluded that previous research displayed a lack of evidence to support a correlation between achievement and medium selection (Clark, 1983). His previous statements demonstrate that media alone have not been determined to provide a better outcome for student learning (Clark, 1983). Clark further discussed that time spent learning, access to more materials and collaboration with a cohort of students in a specific medium may provide a better understanding of educational outcomes (Clark, 1983). Is it the attributes of a specific medium or is it the connection between the learner and the type of instruction that has improved educational performance?

Technological advances have given the educator other methods of educational delivery. Little evidence exists for specific populations of students in physical therapy, however there are some interesting areas that examine the presence of such technology in the classroom. The argument by Clark remains relevant today and attempts to show the benefit of media in physical therapy education have occurred. The purpose of this paper is to discuss media or educational technology and its relation to student achievement in physical therapy education.

## **THE ARGUMENT: MEDIA ARE MERE VEHICLES ...**

The original argument stands that a traditional lecture can be as effective as using other delivery styles to provide instruction. They are simply instructions for delivery; however, individually they do not improve student outcomes (Clark, 1983). Other literature has attempted to find correlations that could potentially influence how information is processed by the learner with the application of such technology. However, their findings conclude that media may improve the instructional design to meet the specific cognitive needs of the learner but not to the discovery of learning (Clark, 1975, 1983; Levie & Dickie, 1973).

Other research has exposed common literature misinterpretations and mistakes in design that had formulated positive assumptions for use of educational technology (Clark, 1983; Mielke, 1968). Previous comparative studies addressed enhanced learning by replicating teaching practices, this approach may not investigate the role of technology itself but rather how the instruction was delivered (Kirkwood & Price, 2013).

When doing so, the authors are not accounting for other variables that may impose a positive effect (Clark, 1983). What is the agent of change? The theory of technological determinism view technology as the primary source of change (Oliver, 2011). However many constructivists acknowledge the efforts of student learning being the roles taken by the instructor, the learner and the applied media or technology (Joy & Garcia, 2000). Performance comparisons may not provide the answers educators seek. However, the researcher should look at other avenues applied with technology that could influence change.

The novelty of new technology can sometimes lead to confounding results. When learners are first exposed to a new learning medium, they may provide greater effort to see improved outcomes;

however once the student learns this technique, over time the effect tends to diminish (Clark, 1983). Student exposure to a specific medium may be overlooked in research studies on technology and provide misguided assumptions.

Often, research has incorporated the use of self-report questionnaires to determine the effects of applied technology on learners. Many of these questionnaires emphasize the potential advantages or disadvantages of the medium or the learner's experience. Concerning the purpose of this paper, literature has examined computer assisted instruction in physical therapy assistant education using these type of questionnaires (Erickson, 2004). The results had determined some interesting positive and negative points. The positive indicators were student independence with learning, availability to review material, and enhanced communication (Erickson, 2004). The usefulness of self-directed learning and student autonomy can pose a benefit to the learner. Having the ability to repeat a lecture or access material at any time can improve or enhance learning. In this same article, the negative reports were the cost of the technology and the time spent to learn the technology (Erickson, 2004). Even though the subjects in this literature report the potential benefit, these are merely attitudes and beliefs and do not indicate specific objective influence on outcome. Other avenues of evidence need to be conducted to confirm or refute these findings. The other argument is that not all parties that include the subject and researcher have the same exact definition of teaching and learning. Other research has shown that there are moderate differences in definitions between the learner and the instructor (Kember, 2001; Kirkwood & Price, 2013; Trigwell & Prosser, 1996).

The argument concerning causal factors for learning outcomes are between sufficient versus necessary conditioning. Sufficient conditions provide information

on past results with previous instructional technology. However, the reproducibility of the outcome is not guaranteed with sufficient conditions; instead replication would need necessary conditions (Clark, 1983). Similar arrangements may improve outcomes, however may not utilize similar cognitive processes. Therefore, the necessary process of learning needs to be explored and defined in research instead of what is sufficient (Clark, 1983).

There are many assumptions and limitations or threats to external validity found in previous research about educational technology. The generalizability of this literature does not provide the necessary means to educational success; therefore the consumer needs to be educationally careful with interpretation of conclusions. The methods and design of research need to be analyzed to determine comparable application. Does technology pose an advantage to educational success? Even though research may be lacking to refute its significance, theorists argue that student understanding and creativity for design may provide benefit to a learner's success (Reeves, 2011).

## **EDUCATIONAL TECHNOLOGY IN PHYSICAL THERAPY EDUCATION**

Educational technology continues to make its way into several classroom settings from simple visual aids in traditional formats to attempts at enhanced learning outside of the classroom in areas such as podcasts. Colleges and universities have suggested utilizing educational technology to enhance quality of education, increase resource allocation, and promote engagement of students (Mathur, Stanton, & Reid, 2005; Nkenke et al., 2012). As previously mentioned, physical therapy education must feature mastery of content as well as skill acquisition. Previous research has employed the philosophical orientation of problem-based learning that incorporates the use of clinical cases to improve decision

making (Frear & Hirschbuhl, 1999; Hooper, O'Connor, & Cheesmar, 1996). In these previous works, higher level thinking incorporated areas of computer-assisted instruction (Frear & Hirschbuhl, 1999; Hooper, O'Connor, & Cheesmar, 1996).

Because of the increased demand for physical therapy education, classroom time becomes very important for skill acquisition. Previous suggested curriculum design has emphasized the *flipped* classroom approach where normal classroom activities are taken outside of the classroom, such as listening to prerecorded lectures or accessing recourses, and outside classroom experiences are brought into the classroom for active learning, such as laboratory skills (Boucher, Robertson, Wainner, & Sanders, 2013). This approach was built on the premise that media are not the answer to educational success, but rather the manner in which it is implemented can be effective (Tucker, 2012). Proposing such a format should entail the protection of learning standards that involve the following: customization for individualized learning, immediate learner feedback, creation of a constructive learning environment, student motivation outside of expected norms, and building of structural content (Boucher et al., 2013; Foreman, 2003). The flipped classroom curriculum was previously implemented in a physical therapy musculoskeletal curriculum that included recorded lectures and article readings followed by assessment modules that consisted of quizzes over learned content and in-class content features, review of discussion material, problem solving, and laboratory skills (Boucher et al., 2013). The outcomes had shown positive feedback from the learner as well as the instructor and course grades had shown an improvement with increased percentage of pass ratings on practical examinations (Boucher et al., 2013). The main emphasis of this research demonstrates the emphasis on guided learning where direc-

tion and emphasis of education is focused and interactions between the educator and student is time efficient. Outside classroom work is assisted with educational technology, where refinement of clinical skills is promoted with face-to-face interaction.

## CONCLUSION

In conclusion, the argument if educational technology provides an effective strategy to improve student outcomes continues to lack evidence when the delivery method is considered the source of improvement. Research in the area of media in education continues to demonstrate lack of proper research design with several assumptions and limitations. Reproducibility of research findings should not be made in comparison to delivery styles, rather the manner in how it was delivered should be considered. Future research should consider other intermediate variables, such as individual learning needs, reflective student feedback, student motivation, and building conceptual knowledge. Instructional media by itself does not influence learning. Utilizing an eclectic approach with traditional formats and technology may spark future research interests. With this in mind, flipped classroom formats may pose some benefit for physical therapy educators to incorporate the use of combined traditional formats and technology to promote classroom efficiency for higher level thinking and psychomotor skill acquisition.

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