

Technology in Teaching

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Abstract:

While teachers' conservative attitude toward technology has been distinguished as a roadblock to effective technology integration in classrooms, it is often optimistically assumed that this issue will decide when the digital generation enters the teaching profession. Utilizing a mixed methodology approach, this study proposed to analyse the current technology usage of digital generation student teachers and the impact of potential interior and external barriers (such as self-efficacy, risk taking, and technology access and support) on their utilization of engineering. Seventy-one student teachers first responded to an online survey regarding their technology usage in classrooms. Subsequently, six participants were purposefully selected, based on their survey responses, to participate in follow-up interviews about their attitudes toward technology and challenges of incorporating technology into instruction. The determinations of the survey proposed that digital generation student teachers' use of technology in the classroom was significantly correlated with their self-efficacy, perceived computer skills, and technology access and funding. Nevertheless, the participants' perceived level of risk taking was not linked to their usage of applied science in the schoolroom. The determinations of the survey indicate that digital native student teachers have not necessarily become more comfortable keeping pace with the fast pace of change in engineering science. Implications and limitations of the findings are discussed

Keywords: Digital Generation, Student Teachers, Classroom Technology Integration, Internal and External Barriers

Introduction:

Rapidly evolving technology has not only fundamentally changed the way in which we live, work and communicate, but also revolutionized the education system. A wealth of studies

looking into ways of harnessing technology to transform teaching and learning suggests that technology, when used appropriately, offers great promises to facilitate teaching, engage students and increase students learning. Technology access in classrooms has been steadily growing in the last two decades and education is witnessing an increase in classroom technology needs. Despite great potentials and increasing accessibility of engineering science in schools, teachers are usually depicted as reluctant and skeptical technology users. Studies suggest relatively few teachers are willing to fully exploit technology within their classrooms and effective technology integration in classrooms is still remarkably low. Teachers' hesitancy around technology has become a salient topic in preparation as the responsibility for effective technology integration inevitably falls upon individual teachers. While teachers' conservative attitude toward technology has been recognized as one of the top barriers in classroom technology integration, it is oftentimes taken for granted that this issue will moderate when the digital natives enter the teaching profession. Digital Natives), are individuals who rise up in the digital world with digital technology as an inbuilt part of their life. Most of the existing literature has sketched a quite vivid and exciting picture of digital natives. They are frequently depicted as the "millennial generation" that is socially connected, digitally literate, shows strengths in multitasking and collaboration, and value immediacy. They are supposed to live in a ubiquitous digital environment and are the true native speakers of the digital language. Digital communities have a digital mindset with which they "think differently from the rest of us. They develop hypertext minds. They leap around all over the place. It's as though their cognitive structures were parallel, non sequential." Based on the above unique traits of digital natives, some researchers and educators posit that technology integration would cease being a problem when digital native teachers create their programs and classroom practices. Since digital communities have now introduced the teaching forefront, is technology integration in classrooms, no longer a problem as previously taken? Unfortunately, a recent survey revealed that although early career digital native teachers may be expert users of technology in their personal sphere, they are NOT more likely to adopt technology in teaching compared to veteran teachers. This seemingly surprising finding is in agreement with a inclination of other studies, which propose that new career teachers' technology skills are evidently improved), yet enhanced technology skills do not automatically transform and augment the curriculum. Clearly, there is a gap between digital native teachers' technology skills and effective classroom technology integration. What

roadblocks are preventing teachers from effectively integrating technology in the course of study? There are two types of technology barriers that may affect teachers' technology user: external and inner. External hurdles comprise a range of subjects, mainly concerning institutional factors such as inadequate technology access, time, training and funding. Financial backing from the entire psychiatric hospital is all important to successful technology integration in the curriculum. Unfortunately, systematic documentation of some psychiatric hospitals has been limited and inconsistent. Internal obstacles include variables such as teachers' underlying attitudes and beliefs towards technology. External barriers are placed as "first hand social club" and internal barriers as "second hand order", and further states that it will be hard to incorporate engineering with first hand order barriers present. Nevertheless, even with first hand order obstacles cleared, teachers still may not "automatically use technology to achieve meaningful outcomes advocated". There is mounting evidence suggesting teachers' beliefs and attitudes toward technology may greatly limit their effective technology implementation in the classroom. The intention of this mixed methods study was to investigate the digital native teachers' use of applied science in classrooms. In the initial quantitative survey stage of this study, the researchers aimed to examine the relationships between the external barriers (technology access and certification), internal obstacles (attitudes and beliefs— risk taking and self-efficacy) and technology use in digital native teachers' classrooms. The follow-up qualitative interview phase helped to explain the quantitative findings. The integration of studies results and interviews helps to create a richer understanding of digital native teachers' use of applied science in classrooms. Specifically, this study consisted of the following quantitative, qualitative, and mixed methods research questions.

What is technology integration?

There is no clear standard definition of engineering consolidation. For some learners, technology integration was seen and analyzed in terms of types of teachers' computer use in the classrooms: low-level (e.g., Students doing Internet searches) or high-level use (e.g., Students doing multimedia presentations, collecting and interpreting data for projects) For other scholars, technology integration was understood and examined in terms of how teachers used technology to carry out familiar events more reliably and effectively, and how such use may be re-shaping these activities. Yet others consider technology integration in terms of instructors using

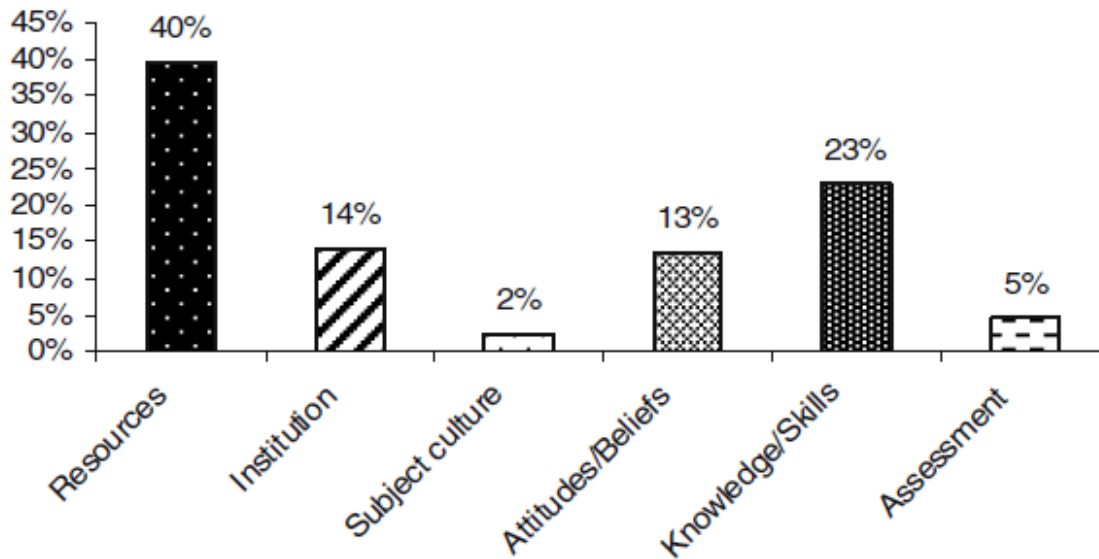
technology to develop students' thinking skills. Despite the deficiency of a clear standard definition, certain prevailing elements appear to burn across the many different current discussions about technology integration. These components typically include the role of computing devices for education.

Barriers of technology integration

A sum of 123 barriers was found from the recapitulation of past empirical studies. In parliamentary law to offer a logical and parsimonious description of the various technology integration barriers, we classified them into six primary categories: (a) resources, (b) knowledge and skills, (c) institution, (d) attitudes and beliefs, (e) assessment, and (f) subject culture. These barriers are recorded in order of the relative occurrence in which they were stated in the studies reviewed (see Fig. 1).

- **Resources**

The deficiency of resources may include one or more of the following: (a) technology, (b) access to available technology, (c) time, and (d) technical support. Lack of technology includes insufficient computers, peripherals, and software. Without adequate hardware and software, there is little chance for instructors to incorporate engineering into the curriculum. Even in cases where technology is ample, there is no assurance that teachers have easy access to those assets. Access to technology is more than simply the obtainability of technology; it involves providing the proper amount and right types of technology in locations where teachers and students can use them. The best



Resources tended to be mastered by technology classes (e.g., Computer studies); therefore resulting in a “pecking order” of subjects where the role of computer laboratories is concerned, putting teachers of non-technical fields (e.g., Art, Humanities) at a disadvantage. Although schools have computers housed in labs, teachers might not have easy access to them if they needed to contend with other teachers for laboratory time. Lack of time is another resource-type barrier. Teachers needed hours to preview web sites, to locate the photos, they required for the multimedia project they assigned to students, or to scan those photos into the computers. Instructors who were willing to operate longer hours paid a personal cost in “burn out” and an eventual exit from the shoal. The lack of technical support is yet some other resource-type. Teachers need adequate technical support to help them in employing different technologies. Using a limited bit of technical support personnel in a school severely hinders teachers’ technology use. More a great deal than not, these technical support personnel were frequently overwhelmed by teacher requests, and could not respond swiftly or adequately.

- **Knowledge and skills**

The deficiency of specific engineering knowledge and sciences, technology-supported pedagogical knowledge and acquirements, and engineering-related-classroom management knowledge and accomplishments has been identified as a major barrier to

Technology integration. Lack of specific technology knowledge and skills is one of the usual reasons given by teachers for not employing technology. The teachers in their survey did not attempt any technology-connected activities with their students until they had acquired basic skills such as logging onto the network, opening and closing files and applications, and basic word processing. In summation to the lack of technology knowledge and sciences, some teachers are unfamiliar with the pedagogy of using applied science. Teachers need to have a technology-supported-pedagogical knowledge and skills base, which they can draw upon when planning to integrate technology into their teaching. Applied science-supported-education may be classed into three categories in which technology serves as: (a) replacement, (b) amplification, or (c) transformation. Technology as replacement involves technology serving as a different way to the same instructional goal.

The lack of engineering science-related-classroom management knowledge and sciences is another barrier to technology integration into the course of study. Traditionally, classroom management includes “the provisions and procedures

Essential to begin and maintain an environment in which instruction and learning can occur and the preparation of the classroom as an effective learning environment”. Classroom management has been identified as the most important factor influencing student learning. Typically, traditional classroom management involves a set of guidelines for appropriate student activities. Although the principles and routines grounded in a non-technology integrated classroom can utilize in a technology-integrated one, there are additional rules and routines to be grounded in the latter due to the inclusion of information processing systems, printing machines, monitors, CD-ROMs, and other engineering resources. Therefore, in a technology-integrated classroom, instructors need to be outfitted with technology- related classroom management skills such as how to organize the class effectively so that pupils receive equal chances to utilize computers, or what to do if students run into technological problems when running on computers.

- **Attitudes and beliefs**

Teacher attitudes and beliefs towards technology can be another major barrier to technology integration. Postures can be defined as specific feelings that show whether a person likes or dislikes something. In the context of engineering integration, teacher attitudes toward technology

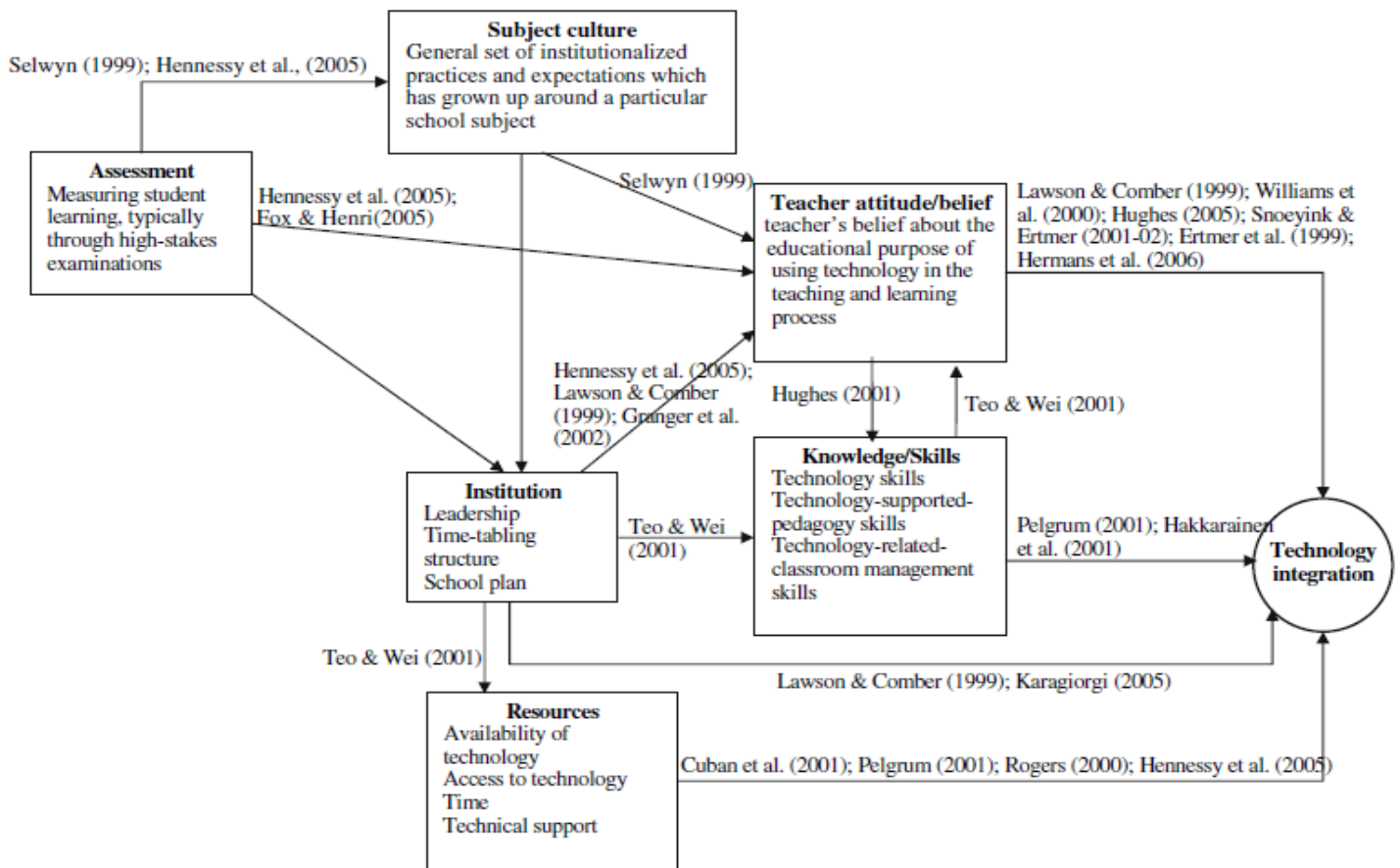
may be conceptualized as teachers liking or disliking the use of applied science. Feelings can be specified as premises or suppositions about something

That is felt to be dead on target. Specifically, teachers' beliefs may include their educational beliefs about instruction and learning (i.e., Pedagogical beliefs), and their feelings about technology. Researchers have found that beliefs determine a person's attitude argued that the determination of whether and how to employ technology for instruction ultimately depends on the teachers themselves and the opinions they hold about technology. Teachers' opinions about technology in the curriculum shaped their goals for engineering employment. Teachers who viewed technology as merely "a way to keep children engaged," did not understand the relevance of technology to the designated curriculum. Computer time was usually granted after regular classroom work was done and as a reward for the completion of assigned projects. To these teachers, other sciences and content knowledge were more significant. Likewise, other researchers have found teacher beliefs about technology to be a major barrier to technology integration.

- **Subject culture**

Subject culture refers to the "general set of institutionalized practices and first moments which have grown up around a particular school subject, and regulates the definition of that field as a distinct field of study". Subject cultures have long-standing histories, reinforced by generations of school practice, and are typically shaped by the subject content, subject pedagogy, and subject assessment. Teachers are reluctant to adopt a technology that seems incompatible with the norms of a subject culture.

- **Identifying the relationships among the barriers**



Model showing the relationships among the various barriers

Strategies to overcome barriers

Barriers	Strategies
Resources <ul style="list-style-type: none"> Lack of access to technology 	Receiving the necessary resources <ul style="list-style-type: none"> Introduce technology into one or two subject areas at a time to assure that teachers and students in those areas have enough technology and access to engineering Make a hybrid technology setup in classrooms that involved cheaper

<ul style="list-style-type: none"> • Lack of technology and access to inputs • Lack of timing • There is also a lack of technical support 	<p>computer systems.</p> <ul style="list-style-type: none"> • Use laptops with wireless connections to save the building and maintenance costs of the computer laboratories • Putting technology into the classrooms rather than in concentrated locations • Rotate students through the diminished number of schoolrooms • Teachers cooperate to produce technology-integrated lesson plans and materials • Reduce class loads for teachers in order to free up some school time • Use student technology helpers
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Current knowledge gaps and recommendations

In discussing these current knowledge gaps, it is useful to adopt the notion of first- and second-order barriers to achieve a more parsimonious classification of the barriers. First-order barriers or obstructions that are

External to teachers; while second-order barriers are intrinsic to teachers. This opinion can also be extrapolated to strategies.

Barriers

The first knowledge gap is linked up with the relationships between the foremost and second-order barriers: How much do we exactly know about how first and second-order barriers interact and act upon each other in hindering the integration of technology for instructional purposes? In the present literature review, the study was unique in that examined the relationship between the two classifications of barriers in more detail rather than just highlighting that the barriers are related to one another. Many researchers have thought that second-order barriers cause more difficulties than the first-order ones. The risk of this premise is that educators and administrators may be headed to assume that overcoming second-order barriers is enough. There are “serious problems with the current attempt to train instructors to apply technology. Most of the current effort takes a very narrow view of what teachers need to use technology—some technical skills and a good attitude”. Having technical skills and a good attitude might help to overcome second-order barriers. Second- and first-order barriers are then inextricably linked together that it is very hard to address them individually. For instance, attempting to change teachers’ attitudes and feelings (a second-order barrier) toward using technology is likely to be ineffectual in the long run if one does not seriously consider converting the way scholars are currently assessed through current high-stakes national examinations (a first order barrier) that discourage using technology during the appraisal. Future research should also look into other barriers that may need to be weighed, especially a when one-to-one student to computer ratio is reached. It would likewise be useful to compare and contrast our model with other existing examples. Six main barriers are shown: (a) stakeholder attitudes and perceptions, (b) stakeholder development, (c) availability and availability of technology, (d) technical support, (e) funding, and (f) time. All barriers are represented in our exemplar, with the exception of “funding.” The lack of support was not played up in our model because it was not explicitly noted in the subject areas we looked back. Maybe this is due to deficiency of funding being implicitly expressed in the barriers already mentioned (e.g., Lack of technology, lack of technical support, or lack of professional development). In that respect is besides a demand for research to examine specific barriers of technology integration in larger detail. We play up the barrier of teacher beliefs in our discourse. As previously mentioned, teachers’ beliefs may include their educational beliefs about instruction and learning (i.e., Pedagogical beliefs), and their feelings about technology. Making the distinction between beliefs and knowledge, Teacher pedagogical beliefs as the final frontier in our quest for technology integration because of the assumption that beliefs are far more

influential than knowledge in predicting teacher behavior due to the stronger affective components often associated with beliefs. Cognition is the prime influence on whether and how teachers use technology. Perhaps the appropriate question to address with regard to this disagreement is under what conditions, beliefs and knowledge will exert the main influence on teachers' use of technology.

Integration strategies

The second knowledge gap relates to the relationships between the strategies. Research has indicated that successful technology integration takes a holistic plan of attack that addresses both first- and second-order schemes. Interestingly, the researchers establish that second-order factors associated with the instructor (e.g., Teachers' knowledge and skills of the broader computing system requirements associated with the use of a specific technology), appeared to play a more significant role in contributing to classroom technology integration efforts than other factors such as having access to technology infrastructure, or support from peers. Future research should be guided to test this claim. In that respect is also a crucial need to determine more about certain strategies. We highlight two in our discussion: subject culture and assessment, and technology integration plan. In short, these studies confirm the notion that subject cultures can be an important barrier that hinders teachers' use of engineering in their precept. Yet, none of these studies investigated specific strategies that can be utilized to overcome subject culture barriers. There is thus a need for further research to look into how teachers could apply technology, specifically in the case that technology is incongruous with a particular subject culture. Interestingly, in that location is evidence showing that the role of technology is not widespread even in open cultures that seem to be congruous with technology. Likely the most pressing demand is for more research to investigate how the employment of technology can fit with the current requirements of standards-based accountability. With respect to technology integration planning, regularly updated their technology plans had significantly more use of technology in subject areas than those that did not. Still, nothing was mentioned about the nature and the actual frequency of such updates.

Further research should be conducted to verify findings, as well as address in greater depth the nature of the updates that move to certain schools having significantly greater uses of technology for instructional purposes. It is likewise significant to analyze the potential drawbacks of each

integration strategy. For example, although the strategy of encouraging teachers to collaborate to create technology-integrated lesson plans and materials could help teachers save time, collaboration in itself can be difficult to achieve given that teachers have many other responsibilities to which they need to attend in a school day. Reported that teachers who were less dependent on other instructors (i.e., Less reliance on the cooperation, participation, or livelihood of other people) tended to experience greater success in incorporating engineering science in their schoolrooms. Likewise, the strategy of having students work cooperatively in groups and rotating them through the diminished number of classroom computers can itself be difficult to plan and present effectively. For instance, studies suggest caution about the conditions that favor success regarding cooperative group study. In particular, groups must have the power to coordinate themselves in ways, which incorporate the contributions of all members. How a teacher structures the tasks, coordinates, and manages productive, cooperative group work in relation to technology utilization is an area that requires further work. Acknowledging the drawbacks is essential for instructors or school decision makers make informed decisions about the strategies they are considering holding out. Future efforts should therefore be used in studying the efficacy and feasibility of these schemes (particularly over a long period of time), leading possibly to some empirical-based guidelines as to how these strategies can be optimally utilized. Some other point regarding strategies is that none of the previous studies we examined included discussion of the findings in relation to past evidence about the integration of a prior technology (e.g., Instructional video). Determinations from the integration of past technologies, may help today's researchers and educators better understand the components that can facilitate the consolidation of current computing devices for instructional uses. In an effort to find out if there are any conflicts between the integration of computing devices and the consolidation of a past technology into teaching and learning, we examined that the findings of research on instructional video. We found that much of what had been written about strategies (and barriers) for integrating instructional television for instructional purposes were similar to the current strategies (and barriers) for integrating computing devices.

Levels of technology consolidation

The third knowledge gap is associated to the barriers and strategies associated with the different levels of technology integration by teachers. Some researchers see technology integration by teachers as an evolutionary process rather than a radical one. Technology integration occurs along different stages: (a) familiarization, (b) utilization, (c) integration, (d) reorientation, and (e) evolutionary. A survey conducted by, with art teachers found that certain barriers were more predominant in certain levels. For instance, first-order barriers such as accessibility and accessibility of technology were most probable to be encountered by instructors at the beginning stages (e.g., Familiarization and utilization). Additional research is needed to validate findings and conclusions about the barriers in other schools and subject areas to determine if the findings are typical of all instructors at the beginning stages or strongly dependent on the specific subject areas. Other additional knowledge gaps related to the stage theory of technology integration include the following: (a) it is unclear whether the stages were derived from long-term observations of private teachers or represented levels that different teachers occupied for a certain period in time, and (b) it is unclear how individual teachers make leaps of progress from one point to another and the strategies employed to assist them act so.

Conclusion

The purpose of this report was to provide information on encouraging the desired improvement in the future teaching situation to those responsible for the integration of Technology into teaching. The findings of this survey suggest that instructors hold a strong desire for the integration of Technology into education, but that they ran across many barriers to it. The major barriers were lack of confidence, lack of competence, and lack of access to resources. Since confidence, competence and accessibility have been found to be critical factors for technology integration in schools, ICT resources including software and hardware, effective professional development, sufficient time, and technical support need to be offered for instructors. No single component in itself is sufficient to bring about good teaching. However, the presence of all components increases the likelihood of excellent integration of Technology in learning and education opportunities

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