International Journal of Learning, Teaching and Educational Research
Vol. 15, No. 13, pp. 1-11, December 2016

Motivating Gifted Students: Technology as a Tool for Authenticity and Autonomy

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Abstract. Gifted student may underperform if unmotivated. Teachers can help students who are gifted to be motivated by using technology to help provide autonomy and authenticity in the curriculum. Technology can be used as a tool for student autonomy when it is used in ways that give the student choices. Teacher can use the Internet to provide students access to different topics. When students can control the depth and breadth of content through what they learn using technology, they are motivated. Technology also allows individual students control over the pacing of learning when they can accelerate through easily mastered or already mastered material, and then slow down when something particularly interesting is encountered. Authenticity, where students are doing work or experiencing learning activities that are equivalent to adult or expert experiences, are accessible to students through technology, but only if teachers plan for it. Particularly web 2.0 technologies allow students to create authentic products for authentic audiences because the can publish and share a variety of media. Technology can facilitate student collaboration and allow for mentoring from experts. Gifted students, who can be motivated by competition, can also increase the competitions available to them by looking for competitions online. Teachers control student access to and uses for technology within the school setting. If teachers are concerned about students who are gifted developing to their full potential, then planning for motivation makes sense and technology is a ready tool.

Keywords: Motivating gifted students; educational technology; authentic learning; autonomous learning

Introduction

Not every gifted child grows up to be a productive adult. Adults who show high levels of productivity often have been encouraged to pursue areas of intense interest, to take risks with new ideas, and to use creativity in their work; all factors that increase motivation (Rogers, 1998). Motivation is a complex construct, for adults or students, as it is influenced by personal characteristics as well as by situational factors (Clinkenbeard, 2012). The strongest predictor of students' on-task behavior in the classroom is their own valuing of the learning activities, and not peer or parental influence (Kilian, Hofer, & Kuhnle, 2013).

Students with the potential for creative productivity may find that the pacing, materials, and approaches to learning in the traditional general education classroom often diminish their curiosity (Harrison, 2004; Little, 2012) and stifle their motivation to work hard at learning. By definition, such students need to receive specialized educational interventions to meet their learning needs and help them reach their full potential (Clinkenbeard, 2012). They require greater instructional intensity or higher levels of autonomy (Russo, 2004) than other students since, to a great extent, their degree of motivation influences their level of productivity (Colangelo, & Davis, 2003; Little, 2012). Creativity and problem solving skills can decrease over time when the curriculum offers few opportunities for students to use them (Russo, 2004; Henriksen, Mishra, & Fisser, 2016).

For high-end learners, teachers need to plan for and then monitor the development of curiosity, creativity, and problem-solving skills. Such development is mediated by motivation to learn, to create, and to achieve at high levels (Colangelo, & Davis, 2003; Little, 2012). Thus teachers must also specifically monitor motivation, linked as it is with so many factors that determine both academic and lifetime success (Gottfried, Gottfried, Cook, & Morris, 2005).

Students work hard only when they are motivated to do so. For gifted students, motivation is increased when they have control over what they will study, how they will study it, and how they will show what they have learned (Clinkenbeard, 2012; Kimball, 2001). This kind of autonomy is rare in many classrooms (Harrison, 2004). In addition, gifted students have a particular need for interaction with people who have specialized knowledge and skills in their areas of interest. Such people can constitute an authentic audience for their work or as mentors (Housand & Housand, 2012; Mammadov & Topcu, 2014). Authenticity is strongly related to motivation for gifted students (Kimball, 2001). Fortunately for the classroom teacher, technology can mediate and even make possible opportunities for students in both the autonomy and authenticity of learning opportunities (Housand & Housand, 2012).

Autonomy

Students identified as gifted want autonomy in their learning; they and their families are among the most proactive in shaping a learning environment that supports their growth and development (Bennett, & Hertzog, 2004; Clinkenbeard, 2012; Colangelo, & Davis, 2003). They often pursue independent projects (Dove, & Zitkovich, 2003), some of which are inspired by school work (Kimball, 2001). Rapid mastery of skills and concepts (Betts et al, 2004; Dove, & Zitkovich, 2003; Harrison, 2004) and leaps of understanding when encountering new material (Harrison, 2004) often characterize the learning of gifted students. Both academically and creatively gifted, students prefer accelerated learning and the freedom to choose at least some of the topics, methods, or tools they use in assignments and tasks (Olszewski-Kubilius, & Lee, 2004; Wong et al, 2006). Choice is important in fostering gifted behaviors such as creativity (Fleith, 2000) or motivation (Clinkenbeard, 2012).

When students have choices around how to learn, such as by pursuing hands-on projects that integrate subject areas or by controlling the pace of their work, they are more likely to be engaged in school work. Other approaches that encourage student engagement are: flexible directions for assignments, unstructured time in which to work on projects the opportunity to collaborate with others, based on mutual interest (Fleith, 2000; Olthouse & Miller, 2012).

Technology helps to motivate gifted students toward high levels of production by mediating the in development of knowledge in specific topics, by providing a medium which lends itself to repeated revision, and by creating a context that facilitates experimentation and risk-taking. The Internet allows students self-directed access to material of high interest across many different subject areas (Boon, Fore, & Rasheed 2007). Because they control the pace of their work they can dwell with one topic long enough to probe for answers (Wong et al, 2006) or rapidly skim sites to construct a satisfying degree of understanding (Wighting, 2006). This ability to explore either the breadth or the depth of a subject by using links and search engines makes technology satisfyingly responsive to learners' needs and interests. Autonomy promotes academic engagement when students control topic, depth or breadth of information, acceleration and pacing, and intensity.

Choice of Topic

Gifted students often demonstrate their abilities to reason with and to acquire knowledge rapidly even in subject areas that have little interest to them (Swiatek, & Lupkowski-Shoplik, 2000). Being "rewarded" by a teacher with more study of the same subject when they complete required assignments, readings, and tasks more quickly than their classmates may not meet their needs for a challenging education (Colangelo, & Davis, 2003). In fact, such "rewards" may discourage them from performing to their full potential. Rather than automatically assigning gifted learners more work on the same topic, teachers need to free them to use their time productively in pursuit of knowledge and skills that interest them (Housand & Housand, 2012; Little, 2012). Students can use technology as a tool for independent study. In addition to using the Internet to find information, they may formally enroll in online courses in topics of interest that are not offered in the local school (Housand & Housand, 2012; Olszewski-Kubilius, & Lee, 2004).

Depth & Breadth

The Internet and various software programs provide students with easily explored information resources written by experts. A student looking up an article online can either click from link to link within articles to experience breadth, or find multiple websites or other resources on the same topic to do in-depth reading. The need for depth and breadth of information can vary according to subject, maturity of the student, and motivation levels. However, a general characteristic of gifted students is that they are capable of synthesizing large amounts of information (Colangelo, & Davis, 2003). Technology allows them to actively pursue independent investigations and energetically seek the amount of intellectual stimulation they need (Harrison, 2004).

One characteristic feature of gifted education is to help students examine the ways that knowledge is structured in different disciplines. As students browse various websites, they can begin to recognize similarities in the way the information in the topic is presented. Such recognition prepares them to begin to transfer knowledge among topics and various contexts. Students who use technology report their awareness of having learned more than they do without technology (Betts, Tardrew, & Ysseldyke, 2004; Boon et al., 2007; Dove, & Zitkovich, 2003; Garcia, & Rose, 2007; Kimball, 2001; Siegle, & Foster, 2001; Wighting, 2006; Wong et al, 2006). A second aspect of autonomy is being able to choose how much to learn. Because gifted students have such a variety of interests, technology can satisfy their need for depth of information about a great variety of subjects. Technology provides easy, quick, searchable access to high-quality current information (Mohide, Matthew-Maich, & Cross, 2006).

Acceleration and Pacing

A third aspect of autonomy is having control over how fast to learn. When given a choice, gifted students typically select courses that allow self-paced learning (Betts et al., 2004; Olszewski-Kubilius, & Lee, 2004). Because students access information and materials at their own zone of proximal development, computers support rapid learning and thus influence student levels of achievement. Without the possibility of working flexibly with content, some able learners can become discouraged at the repetition and redundancy in the curriculum. Acceleration offers a solution for this problem. Curriculum compacting, when students are pretested on content and then excused from assignments which cover material that is already mastered, can assure teachers that gifted learners know the curriculum for which they are responsible; the instructional time created from compacting can be devoted to accelerated learning (Ba, Tally, Tsikalas, 2002; "Digital Imaging," 2001; Dove, & Zitkovich, 2003; Smith, & Weitz, 2003).

In the general education classroom, it is usually the teacher who controls the scope and sequence of materials and he or she is typically responding to the needs of the majority of the students in the classroom. Technology gives gifted learners the freedom to select material that better corresponds to their learning needs. An amount of this material is above grade level (Neuman, & Celano, 2006; Olszewski-Kubilius, & Lee, 2004). Because many gifted students are capable of handling the material at a faster rate, they need the challenge of acceleration to keep their motivation for learning. Gifted students may also develop their abilities with technology at a faster rate than average students.

Technology can be used to help with curriculum compacting and acceleration. Some students have difficulty completing tasks that depend on lower level skills (Zentall, Moon, Hall, & Grskovich, 2001); computers can differentiate tasks so they provide the appropriate skill level set for each child. When higher achieving groups are given technology to aid in learning, they reach even higher levels of achievement (Betts et al., 2004; Siegle, & Foster, 2001). In a study of self-paced math software that allowed students to explore subjects thoroughly,

gifted students typically tried a greater number of practice problems than did average students (Betts et al., 2004). Self-paced software allows students to speed up or slow down to explore topics or concepts as needed or as interest dictates.

In addition to giving gifted learners access to appropriately leveled materials, technology can also make on-line courses available to them. Schools need to have a plan for granting credit for classes taken through distance learning organizations. It is especially important when students demonstrate mastery of material by performing well on Advanced Placement exams (Olszewski-Kubilius, & Lee, 2004). Programs and structures that help students earn college credit can provide appropriate acceleration.

Intensity of engagement

Another aspect of autonomy that gifted students value is the opportunity to determine the intensity of instruction. Gifted students generally seek intense experiences (Kimball, 2001; Olszewski-Kubilius, & Lee, 2004) and typically have the ability to maintain a narrow focus for an extended period of time (Colangelo, & Davis, 2003; Kimball, 2001). When students control the intensity of instruction, they immerse themselves in a subject in which they have a strong interest, rapidly obtaining the basic knowledge of that subject. Then, they move quickly to higher levels of thinking and creativity within the topic (Sak, 2004). Technology provides resources both for immersion and for rapid transfer to productive creativity (Henriksen et al., 2016; Kim, Park, Yoo, & Kim, 2016) as students look at multiple websites and communicate with groups of people who have similar interests (Clinkenbeard. 2012).

Although, emotional intensity is often a characteristic of creative people, it is often not adequately addressed in many classrooms. Many gifted students may have a strong sense of justice (Colangelo, & Davis, 2003) and actively seek information about topics about which they are passionate. The computer provides up-to-date resources for students to connect with issues, advocate for causes, and link with social networks of people who can help them develop their empathy. Additionally, the Internet can provide information about career paths that relate to their passions. Some gifted students find it motivating to understand how their passions can translate into a future career, and they tend to seek this information earlier than other students (Greene, 2006).

In summary, autonomy is very important to gifted learners, and technology offers multiple ways to help teachers provide choices in the classroom. Allowing learners to have control over their use of instructional time, their choice of topic, its breadth or depth, the speed with which they access new information or skills, and the intensity of engagement puts the responsibility for learning into the hands of the learners. Most gifted learners prefer it that way (Colangelo, & Davis, 2003; Kimball, 2001).

Authenticity

While autonomy is important for gifted students, they also desire authenticity in their work. They want to know why they should learn particular topics or skills

and they dislike what they perceive as "busy work" (Colangelo, & Davis, 2003; Zentall et al., 2001). Teachers can use the tools of technology to ground student work in authentic assessment by way of authentic production, authentic audiences, and competition (Housand & Housand, 2012; Mammadov & Topcu, 2014).

Gifted students are more likely than average students to ask questions about the relevance of the underlying structure of knowledge (Colangelo, & Davis, 2003). Therefore they particularly benefit from understanding how certain knowledge and skills fit into the structure of a discipline, and seeing mentors use knowledge and skills in their work in the discipline. Gifted students are motivated by what seems important and relevant.

Authentic Production

Gifted students are more likely than others to experiment with their abilities (Betts et al., 2004; Kimball, 2001), and exhibit a preference for acquiring knowledge and skills through creation of authentic projects ("Digital Imaging," 2001; Dove, & Zitkovich, 2003; Kimball, 2001) completed independently (Zentall et al., 2001). These products can demonstrate knowledge in subject areas (Garcia, & Rose, 2007; Mohide et al., 2006; Wong et al, 2006), and by using technology, they increase the hands-on, constructivist aspect of learning (Zentall et al., 2001).

Technology aids students in dealing with minor barriers to excellent production of work such as being able to use spell check or an online dictionary or thesaurus to make the best word choice. When creative students are not slowed down or distracted by aspects such as the inability to spell a word, they are more likely to complete assignments (Fleith, 2000). Technology allows them to focus less on these "inconveniences" and more on actual production issues similar to those with which an expert would be concerned during production.

A variety of software can help students develop authentic products. Multimedia software can structure their work with audio files, pictures, animation, or movies. Although gifted students may start with simple products, as their skill levels increase, the complexity of what they produce also increases ("Digital Imaging," 2001; Olthouse & Miller, 2012). Authentic practice helps students gather the necessary experience within a discipline to move towards becoming an expert (Colangelo, &.Davis, 2003; Mammadov & Topcu, 2014). When students publish stories, poetry, fan fiction, comics, podcasts, and movies for public consumption using blogs web pages and other web 2.0 technologies, their products are as readily accessible as, and can be compared to, those produced by adult experts (Olthouse & Miller, 2012). Projects and assignments that use software and other technology resources employed by professionals help students see the relevance of what they are learning.

Gifted students are motivated by projects that they perceive as making a difference in the real world. Although technology has the potential to create self-centered individuals (Cross, 2006), it can also be used to help students become aware of current concerns and issues around the world. Through service

learning projects with real world problems, students can use technology to locate data and background information that provide the rationale for particular projects. Technology can connect them to people doing similar project. Technology can be used to organize, plan, manage, facilitate, and reflect on these service learning projects.

Original and elaborated products (Harrison, 2004) as well as technology can be used to develop products that expand creativity ("Digital Imaging," 2001; Dove, & Zitkovich, 2003; Fahey, Lawrence, & Paratore, 2007; Henriksen et al., 2016; Johnsen, Witte, & Robins, 2006; Kim et al., 2016; Siegle, & Foster, 2001; Taylor, & Duran, 2006; Wong et al, 2006). Product topics accessible through technology are unlimited (Kimball, 2001). Students can use the computer to communicate, edit and share creative ideas (Fahey et al., 2007; Fleith, 2000). The creativity, evaluation and synthesis at the heart of an original product can be shared via the Internet through public process skills portfolios, which trace the development of original work by keeping track of peer or self-critiques of drafts of projects and reflections on learning (Fahey et al., 2007; Olthouse & Miller, 2012). As technology provides support for discovery learning and open-ended questions, it also helps support creativity development (Fleith, 2000; Henriksen et al., 2016; Kim et al., 2016).

Authentic Audience

In schools the most obvious audiences for student work are peers, younger students, teachers, and parents. These audiences, as appreciative as they may be, may not actually be the most authentic audiences for students work. Authentic audiences are groups of people who share an interest in a subject matter, have knowledge of the typical products within the discipline, and can therefore critique student work. The Internet can connect students to pre-existing interest groups, and provide a ready-made authentic audience for their work which can give them the motivational push to work beyond the minimum requirements for an assignment. Their work will often reflect their full potential when it is seen by knowledgeable others (Fahey et al., 2007; Mammadov & Topcu, 2014; Wong et al., 2006). Authentic audiences can provide a context for practicing skills required for creative productivity such as creating multiple drafts, editing their work, and thinking about audience.. Students can gain a greater understanding of what experts actually do who work in the subject area for which the products were designed (Fahey et al., 2007; Mammadov & Topcu, 2014).

Technology can foster communication with others who share interests through email, instant messaging, webcams, message boards, and other online tools ("Digital Imaging," 2001; Mammadov & Topcu, 2014). It also presents multiple options for sharing products: public web pages, blogs, wikis accessible only by invitation, or emails to experts who might not be available locally (Fahey et al., 2007; Garcia, & Rose, 2007; Olthouse & Miller, 2012). It can be used to communicate with experts who can serve as guest speakers (Fleith, 2000), mentors (Dove, & Zitkovich, 2003), or critics of students' work (Mammadov & Topcu, 2014).

Competition

A finale aspect of authenticity is participation in competitions, which allow gifted students to compare themselves with their peers (Colangelo, & Davis, 2003; Housand & Housand, 2012; Olthouse & Miller, 2012). They can acquire a realistic perspective as to whether their work is excellent in the field versus just excellent in their local environment. Such perspective often motivates students to work harder (Clinkenbeard, 2012).

The computer can help students find competitions in a variety of subject areas locally or even nationally, both in-person and virtual competitions. Students may participate in everything from poetry, robotics, history, to problem solving. Some competitions require a long term time commitment and guidance from a mentor, but when students participate in these competitions it may increase their access to resources such as financial support to attend college or extracurricular programs, and access to experts through mentors or internships (Colangelo, & Davis, 2003; Housand & Housand, 2012; Mammadov & Topcu, 2014; Olthouse & Miller, 2012).

In recent years, computer games and Internet activities that require memory or allow for competition have become increasingly popular. Some allow the player to compete against the computer; others organize ways for people to compete against each other. Simulation games that feature problems to solve or quests to experience allow (Tünzün, 2007; Williams, Ma, Feist, Richard, & Prejean, 2007) students to compare their relative standing even while the game is progressing.

In summary, technology offers multiple opportunities for teachers to create authentic learning contexts in the classroom. Computers make is possible for students to experience authentic production with all the freedom that comes from a context which promotes risk-taking and experimentation, multiple revisions and iterations of ideas and the creation of original products that solve real problems. Through technology, students can interact with authentic audiences joining communities of learning and practice that provide both academic and social support in the pursuit of expertise (Mammadov & Topcu, 2014). Finally, the Internet can facilitate students' participation in competitions that allow them to judge their standing among their intellectual peers (Housand & Housand, 2012). Engagement with these dimensions of authenticity provides perspective on learning for gifted students. Most gifted learners prefer it that way (Colangelo, & Davis, 2003; Kimball, 2001; Olthouse & Miller, 2012).

Conclusion

Students frequently select computers as tools for learning tasks (Fleith, 2000; Zantall et al., 2001); however, it is clear that teachers control technology use both in school and in relation to school work (Kimball, 2001). Instruction and learning with technology and the use of technology by gifted students can take many forms. Technology related tasks can range in complexity from simply copying someone else's poem in order to practice typing to writing a complex paper that reports original research to creative multi-media presentations. Students may use computers, videos, and televisions as sources of information, tools for self-selected research projects, or purely for entertainment. (Ba et al., 2002).

For gifted students it is crucial that teachers help them understand and adopt productive uses of technology that go beyond entertainment. Use of technology in schools should be related to a need for it (Baule, 2007), and a need is clearly present in educating gifted students. At school, gifted students benefit from a climate where using technology for learning challenges them, and helps fill gaps in their learning. In this way, technology use at school becomes a model for how to use it at home.

Potential Issues

Students may benefit from use of technology, but this does not necessarily mean that it is available to them. Funding for educational technology is frequently controlled by the school or district, and classroom teachers may have little or no input in decision processes related to selecting technology for their own classrooms. Some schools and districts also restrict access to or possible uses for certain technology applications, such as not allowing public blogging by students, restricting access to certain websites, or banning cell phones from classrooms. This lack of access to some technologies may impact the technology strategies available for teachers to use with students. Additionally even if a technology is available, the teacher may wish to have professional development in using the technology in educational settings before implementing it with students (Tondeur, Forkosh-Baruch, Prestridge, Albion, & Edirisinghe, 2016). When teachers are ready to implement new technology with students, then they will need to include time to introduce and teach how to use the technology, even if it is imbedded within the context of a particular assignment (Zimlich, 2015).

Further research needs to be done to help determine which technologies are both motivating to students and which have the greatest impact on achievement. As new technologies are developed, schools will need data to help make decisions about which technologies are worth investing money and time into implementing in classrooms (Tondeur et al., 2016). Finally, student-choice is key in the argument for how technology is motivating. Allowing students options for creativity can be motivating. Additional research examining the interaction between creativity and technology is warranted (Henriksen et al., 2016).

Technology can be a tool to help teachers ensure autonomy and authenticity for gifted learners. However, teachers have to purposefully plan to use technology in ways that motivate students (Housand & Housand, 2012). Students who are gifted can use technology to learn about self-selected topics, to accelerate their learning, to add challenge, to create products, to communicate with mentors, to collaborate with other students, and to engage in competition. As new technologies become available in the school setting and as tech-savvy teachers enter the field gifted students could increasingly encounter technology that is used to meet their unique set of needs.

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