The Transition from Extrinsic Rewards toward Intrinsic Motivation: The Role of EdTech

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Abstract

More now than any other time in modern history, technology is influencing the education sector all around the globe in unprecedented ways. Technology can have significant impact on students in enhancing their engagement and enabling them to learn and retain more information. Educational technology (EdTech) can also work as the prime force to enhance students' motivation to perform better. Different factors relevant to educational technology, like user-friendliness, users' curiosity for new learning tools, and psychological satisfaction contribute effectively to enhancing students' intrinsic motivation in the long run rather than increasing extrinsic rewards, which are effective for short-term basis. This study investigates the positive role of EdTech on student learning and explores the ways technology can be used to enhance the motivation of learners. This paper also provides an in-depth analysis on how EdTech can successfully help make the transition of students' drive from the receipt of

extrinsic rewards to that of intrinsic motivation, and how that transition can influence students to strive harder and achieve their targets. Useful recommendations have been offered that will help future researchers and EdTech developers to work on tools and applications that will play important roles in enhancing the intrinsic motivation of the learners.

Keywords: Education Technology (EdTech); Motivation; Technology; Extrinsic Rewards; Intrinsic Motivation.

Introduction

With the advancements in information and communication technology, different kinds of smartphones, laptops, tablets, and other digital devices are used extensively as learning tools. Learners are encouraged to use technology to fulfill different purposes such as submitting class assignments, accessing course materials, reading articles related to coursework, communicating with the instructor and with other students, and more.

Teachers are also offering a variety of deeper learning opportunities in classrooms that are equipped with the latest technology. This has helped enhance students' creativity and engagement with the added benefit of making them enthusiastic and passionate in their learning process (Bester, 2013). In these ways, Education Technology (EdTech) has contributed positively to changing the entire teaching and learning system.

Educational technology can also work as the prime force to enhance students' motivation to perform with extrinsic rewards. Areepattamannil et al. (2011) have mentioned that extrinsic rewards like different gaming elements may enhance the motivation to achieve the learners' goal, but it works only for a short period of time. In some cases, extrinsic rewards also have negative impacts. For instance, extrinsic rewards sometimes result in reducing motivation, creativity, and performance (Fang et al., 2013; Xue et al., 2020), or enhancing their disruptive behavior (Bear, 2010). On the other hand, intrinsic motivation, i.e.,

the motivation that comes from within the students supports the use of EdTech on a long-term basis and leads to successful achievements (Lei, 2010). It is also shown that intrinsic motivation with low extrinsic rewards helps improve performance (Lemos & Verissimo, 2014). In this review article, we will discuss the ways for successful transition from extrinsic rewards to intrinsic motivation and the role of EdTech on learners' motivation.

A Brief Overview of Extrinsic Rewards, Intrinsic Motivation, and EdTech

Combination of forces that arouses, continues, and directs particular type of behavior is often called motivation (Shaheen, Perveen, & Malikz, 2013). It is an indispensable factor that inspires individuals to give their best performance and assists in achieving their goals (Vincent & Kumar, 2019). For students, motivation is a persuasive feeling that always offers positivism to them to accomplish an activity or a task to the end and become successful no matter how tough and hard it is (Gopalan et al., 2017).

In the process of learning new knowledge and skills, intrinsic and extrinsic motivation are two major factors that influence student success. However, these two types of motivation do not have the exact same effect on student learning and performance (Lei, 2010). Motivation to engage in an activity for its own sake is known as intrinsic motivation. Intrinsic motivation involves engaging, challenging, and eliciting feelings of pleasure along with satisfaction. It can drive the learning process and outcomes and can also predict academic achievement (Reed & Reay, 2015). As argued by Brophy (2010), students who are intrinsically motivated are more likely to enjoy learning, be actively engaged, and exhibit enhanced persistence, performance, and creativity.

Extrinsic motivation is well-defined as a motivation to participate in an activity based on meeting an external goal, winning a competition, garnering praise and approval, getting payment or receiving an award. Unlike intrinsic motivation, extrinsic motivation is not driven by the desire to involve in an activity for its own sake (Thomson & Jaque, 2017). According

to Vincent and Kumar (2019), “Extrinsic motivation refers to behavior that is driven by external rewards such as money, fame, grades, and praise. This type of motivation arises from outside the individual, as opposed to intrinsic motivation, which originates inside of the individual” (p. 484).

At present, different types of extrinsic rewards are being used to enhance the motivation of the students of elementary schools. For instance, gamification is regularly being used inside the classrooms that involves selecting game elements and using these elements for creating a game-like environment to enhance the engagement and motivation of students (Lister, 2015). In most cases, these game elements include badges, leaderboards, or points (Mekler et al., 2013). Some other game elements being used as digital or external rewards include avatars, ranks, feedback, etc. (Lister, 2015).

Educational technology (EdTech) is related to the process of analyzing, developing, designing, implementing, evaluating the instructional environment and learning materials with a view to improving teaching and learning (Ross et al., 2010). EdTech includes the computer, LCD projectors, various software applications, camcorders, scanners, digital cameras, the internet, satellite, interactive TV, audio, video conferencing, artificial intelligence and so on (Kurt, 2015). As argued by King and South (2016), technology in education can help affirm and advance the relationships between students and educators, introduce new approaches to learning and collaboration, and assist in meeting the needs of all learners.

Methods

We conducted a comprehensive literature review of 26 research papers published in reputed journals and conference proceedings in the last 10 years that highlighted issues related to extrinsic rewards, intrinsic motivation, and EdTech. All of the research papers selected for this invited review article are peer-reviewed. Peer-reviewed conference papers

were also selected for writing convenience. After carefully analyzing the findings, we summarized the results accordingly. A brief overview of different researchers' findings is presented here. For finding relevant articles, different search terms were used, like motivation and EdTech, technology and motivation, extrinsic rewards, intrinsic motivation, and EdTech, etc.

Results

The results obtained from the analysis of different peer-reviewed articles are summarized in the table below:

Table 1: Research Outcomes

Author, Year	**Title of Publication**	**Purpose/Objective of the Paper**	**Method used (Qualitative/ Quantitative /Mixed)**	**Results**
(Lei, 2010)	Intrinsic and extrinsic motivation: evaluating benefits and drawbacks from college instructors' perspectives	To evaluate the benefits and drawbacks of intrinsic and extrinsic motivation in relation to student learning.	Qualitative	Intrinsic motivation can promote student learning and achievement better than extrinsic motivation.
(Rogstadius et al., 2011)	An Assessment of Intrinsic and Extrinsic Motivation on Task Performance in Crowdsourcing Markets	To find out a novel approach of extrinsic or intrinsic motivations to increase the quality of crowd workers' output.	Quantitative	Intrinsic motivation can indeed improve the quality of workers.

(Afzal, 2010)	A Study of University Students' Motivation and Its Relationship with Their Academic Performance	To identify the influence of students' motivation on their academic performance.	Mixed	Intrinsically motivated students perform much better academically than students who are extrinsically motivated.
(Areepattamannil et al., 2011)	Intrinsic Motivation, Extrinsic Motivation, and Academic Achievement among Indian Adolescents in Canada and India	To examine the relationships among intrinsic motivation, extrinsic motivation, and academic achievement for the Indian immigrant adolescents in Canada.	Mixed	Indian immigrant adolescents in Canada had higher intrinsic motivation and academic achievement than their peers in India, while extrinsic motivation had a negative predictive effect.
(Lemos & Verissimo, 2014)	The relationships between intrinsic motivation, extrinsic motivation, and achievement, along elementary school	Investigating the relationships between student's intrinsic (IM) and extrinsic motivation (EM) and their effects.	Quantitative	Intrinsic Motivation (IM) and Extrinsic Motivation (EM) can coexist and are not contradictory. IM is also steadily associated with better achievement.
(Isiksal, 2010)	A Comparative Study on Undergraduate Students' Academic Motivation and Academic Self-Concept	To investigate Turkish and American undergraduate students' academic motivation.	Qualitative	Turkish students had higher intrinsic scores whereas American students had higher extrinsic scores.

(Chiu & Chow, 2010)	Culture, motivation, and reading achievement: High school students in 41 countries	To assess the impact of extrinsic motivation on reading achievement.	Qualitative	the link between extrinsic motivation and achievement was weaker for both boys and girls.
(Wormingto, 2012)	A person-centered investigation of academic motivation and its correlates in high school	To document motivational profiles and their school-related correlates among high school students.	Quantitative	Both extrinsic and intrinsic motivation may enhance the student's outcomes
(Hayenga, 2010)	Profiles of intrinsic and extrinsic motivations: A person-centred approach to motivation and achievement in middle school	To identify and evaluate naturally-occurring combinations of intrinsic and extrinsic motivations	Mixed	Students with high intrinsic motivation coupled with low extrinsic motivation received higher grades than others.
(Hung, 2011)	The influence of intrinsic and extrinsic motivation on individuals' knowledge sharing behavior	To investigate the effects of intrinsic motivation (altruism) and extrinsic motivation (economic reward, reputation feedback and reciprocity) on knowledge sharing.	Quantitative	Motivation such as economic reward may not be an adequate motivator of knowledge sharing.
(Lee et al., 2010)	The relationship between future goals	To study the relationships between	Qualitative	To enhance school motivation, teachers should

	and achievement goal orientations: An intrinsic–extrinsic motivation perspective	students' future goals (FGs) and their immediate achievement goal orientations (AGOs).		encourage students to adopt intrinsic AGOs and FGs.
(Kong et al., 2012).	The effects of peer intrinsic and extrinsic motivation on MMOG game-based collaborative learning	To examine peer motivational factors influencing intention to adopt Massively Multilayer Online Game and technology-based collaborative learning methods	Mixed	An individual player's intrinsic and extrinsic motivation have significantly positive influence on their willingness to learn both individually and collaboratively.
(Sheehan, 2018)	Associations Between Motivation and Mental Health in Sport: A Test of the Hierarchical Model of Intrinsic and Extrinsic Motivation	To test four mental health outcomes in the motivational sequence posited using the Hierarchical Model of Intrinsic regulation and Extrinsic Motivation.	Quantitative	Integrated motivation had a negative association with anxiety, and intrinsic motivation had a positive association with depressive symptoms.
(Hazrati-Viari et al., 2012).	The effect of personality traits on academic performance: The mediating role of academic motivation	To examine the effect of personality on academic motivation and academic performance.	Mixed	In addition to motivation IQ, learning approaches and environmental variables can influence academic performance.

(Kışoğlu, 2018)	An Examination of Science High School Students' Motivation towards Learning Biology and Their Attitude towards Biology Lessons	To examine motivation of science high school students towards learning biology and their attitude towards biology lessons.	Quantitative	Intrinsic motivation and future occupation (extrinsic motivation-career) can motivate students more towards learning biology.
(Goodman, 2011)	An Investigation of the Relationship between Students' Motivation and Academic Performance as Mediated by Effort	To evaluate the relationship between university students' motivation and their academic performance.	Quantitative	Intrinsic motivation is the strongest predictor of academic performance, followed by effort.
(Oudeyer et al., 2016)	Intrinsic motivation, curiosity, and learning: Theory and applications in educational technologies	To study the bidirectional causal interactions between curiosity and learning and discusses how these interactions can be powered in educational technology applications.	Mixed	Intelligent tutoring systems (Machine Learning, Artificial Intelligence) can be designed to accelerate curiosity and learning as learners' brain is intrinsically rewarded by those novel features.
(Yardimci, 2017)	A study of the relationship between the study process, motivation resources, and motivation	To analyze the relationship between the study method, and motivation resources and problems regard to	Mixed	Problem Based Learning (using EdTech) more effectively increases students' intrinsic

	problems of nursing students in different educational systems	nursing students in different educational systems in Turkey.		motivation and helps them to acquire learning skills.
(Buil et al. 2019)	Encouraging intrinsic motivation in management training: The use of business simulation games	To understand how business simulation games used in management training must be designed to improve motivation, engagement, and learning.	Qualitative	Business simulation games are effective tools for motivating and engaging players as satisfaction of the psychological needs with business simulation games influences players' intrinsic motivation.
(López-Fernández, 2019)	Motivational impact of active learning methods in aerospace engineering students	To understand how aerospace engineering students' motivation works.	Qualitative	Active learning methods like Project Based Learning help to develop both intrinsic and extrinsic motivators and thus enhance the performance.
(Rockich-Winston et al., 2018)	Faculty motivations to use active learning among pharmacy educators	To evaluate the relationship between faculty intrinsic motivation, extrinsic motivation, and the extent of active learning use in the classroom.	Quantitative	Intrinsically motivated faculty members to use active learning are more likely to dedicate additional class time to active learning.
(Chin-Wen Liao, 2019)	The interactivity of video and collaboration for	To find out the effect of an instructional video and collaboration to the	Mixed	Collaborative DGBL promoted intrinsic motivation and reduce both

	learning achievement, intrinsic motivation, cognitive load, and behavior patterns in a digital game-based learning environment	learning achievement, intrinsic motivation, cognitive load, and learning behaviors of students within a digital game-based learning (DGBL) environment.		intrinsic and extraneous cognitive loads.
(Chan et al., 2016)	Using an educational computer program to enhance student performance in financial accounting	To investigate the effect of an educational computer program *Principles Aren't That Hard* (PATH) on intrinsic motivation and performance in accounting education.	Qualitative	Relative to Blackboard and the traditional paper medium, PATH leads to highest intrinsic motivation, which increases system use when perceived usefulness is higher than lower.
(T.J. Dunn, 2019)	Technology Enhanced Learning in higher education; motivations, engagement and academic achievement	To assess the impact of emotional, cognitive and behavioral engagement with Technology Enhanced Learning (TEL) on students' grades.	Quantitative	Intrinsically motivated students were more likely to engage with TEL and student-created social media activity was most predictive of grades.
(Partovi & Razavi, 2019)	The effect of game-based learning on academic achievement motivation of	To test the effectiveness of the Game-Based Learnings on the academic achievement motivation of the	Mixed	The computer educational game improved academic achievement motivation of elementary students and thus using computer-based

	elementary school students	elementary school students		games in elementary school students is necessary.
(Filsecker & Hickey, 2014)	A multilevel analysis of the effects of external rewards on elementary students' motivation, engagement and learning in an educational game	To examine the effects of external rewards on fifth graders' motivation, engagement and learning while playing an educational game	Mixed	Students with the external reward showed significantly larger achievements in conceptual understanding (proximal) and non-significantly larger gains in achievement (distal).
(Jeno et al., 2017)	The effect of a mobile-application tool on biology students' motivation and achievement in species identification	To test the effect of the mobile-application on students' intrinsic motivation, perceived competence, and achievement	Quantitative	Mobile-application enhances intrinsic motivation, perceived competence and achievement in species identification.

Discussion

How Technology Can Enhance Learners' Motivation

As argued by Shin (2012), technology and games yield positive results consistently regarding students' motivation, attention, persistence, and attitude toward learning. When students work on challenging tasks using game technology, their motivation to compete against and improve their own previous scores increases. Technology-based games provide various options that students can choose based on their individual requirements. This can promote positive attitudes toward motivation and learning. For instance, games like the Ripple Effects and the Social Express have been found as effective in enhancing the

self-awareness, self-motivation, cooperation and problem-solving abilities (King & South, 2016).

Another major factor is student engagement. Students are more engaged when simulating activities are associated with reading texts, which is possible by using technology (Gustad, 2014). High level of engagement is always a priority for educators, and technology can significantly help them achieve this. Technology allows students to collaborate with each other easily and gain a deeper understanding of topics that interest them. Furthermore, submitting assignments as blogs, podcasts or videos, different kinds of infographics, virtual learning, etc. can work as the motivating factors for them and enhance their engagement (Gustad, 2014).

As identified by Bester et. al. (2013) learners exposed to technology have significantly higher attention and motivation than those not exposed to technology. A more interactive learning environment can be created by implementing technology. This enables learners to use multi-modalities, which enhances their concentration and motivation to perform better. They further argued that where teachers become successful in capturing the attention of learners using technology, an optimal learning situation is created, and the learners become more motivated to focus on the learning tasks. This also enhances the possibility of higher achievement.

Another important implementation of Educational Technology is Problem Based Learning (PBL) system. It is revealed that PBL and technology fit together seamlessly. Through PBL, students are positively motivated as they are confronted with real-world scenarios. By using technology as a tool, students get the opportunity to become better prepared for the dynamic world in which they live, that help them solve real problems. Yardimci et. al. (2017) reported that Problem Based Learning (using EdTech) educational

system improves nursing students' deep-learning approaches and affects their motivation resources more effectively than other educational systems in Turkey.

Isabel et. al. (2019) mentioned that psychological satisfaction can play a vital role to enhance the student's intrinsic motivation. They addressed that three distinctive psychological needs for competence, autonomy, and relatedness are required to maintain intrinsic motivation. They conducted the study to understand how business simulation games used in management training can be designed to improve motivation, engagement, and learning. They found that business simulation games are effective tools for motivating and engaging players as the satisfaction of basic psychological needs with business simulation games influences players' intrinsic motivation.

When any technology becomes more user-friendly than the conventional method, such as by saving time or reducing cognitive stress, it increases the motivation of the students. Chan et. al. (2016) argued that PATH (a computer program) leads to highest intrinsic motivation, which increases the acceptance of the system to use when individuals perceive that its usefulness is higher. Many people, therefore, claim that technology is the language of this era, so definitely it should be primarily used by the young generation.

Different education apps on smartphones, computers, tablets have been shown to be beneficial for the children as these enhance their engagement to learning (Oudeyer et al., 2016). However, care should be taken to avoid using education technology as a babysitter to capture the children’s attention for the sake of passing the time. It is thus a crucial factor to consider the situation of each child and adapt their capabilities to the use of technology so that more effective learning is generated (Yanguas, 2020). Parents also appreciate those approaches as these educational technologies can save their time and effort to teach their beloved kids with higher efficiency (Yanguas, 2020). For instance, an educational app called *Todayit* allows students to keep track of their studies. Furthermore, with the series of

analytics and useful feedbacks provided by this app, students are able to plan their studies better and keep themselves motivated to achieve their goals (Pilcher, 2018). Different game-based apps like VocabTrainerA1 motivate learners and meet their language learning requirements by seamlessly combining individual and collaborative learning tasks (Berns et al., 2016).

However, some other people deeply believe that educational technology can never create the values of discipline, punctuality, and many others which is essential for. They argue that learning does not only associate with receiving information but rather practicing the skills of problem solving and critical thinking, that only live teachers can do (El Miniawi & Brenjekjy, 2015).

How EdTech Can Help Make a Successful Transition from Extrinsic Rewards to Intrinsic Motivation

As mentioned previously, intrinsically motivated students perform much better academically than those who are extrinsically motivated (Afzal et. al., 2010; Areepattamannil et al., 2011; Goodman, 2011). The ways EdTech can successfully help to make the transition from extrinsic rewards to intrinsic motivation needs to be clarified.

Afzal et. al. (2010) concluded that students who are intrinsically motivated perform much better academically than students who are extrinsically motivated. He argued that students who are extrinsically motivated might do a good job or perform better to obtain a certain reward, but it does not last long and cannot keep them motivated in the long run (Afzal et. al., 2010). Their overall performance does not improve consistently. For example, they might perform very well in one semester, one class, or on a short quiz to achieve a certain reward or goal and then next semester might show poor performance if the reward does not exist anymore. Because their performance does not remain constant, it may create a negative impact in their academic career. In contrast, intrinsically motivated students take up

tasks or perform well academically for their own interest as well as their own motivation to learn. Such students are really interested in learning the subject or skill which translates to overall long lasting improved performance (Afzal et. al., 2010).

Lemos et. al. (2014) argued that intrinsic motivation consistently enhances performance of students of elementary schools, whereas there exists a negative relationship between student's performance and extrinsic motivation. Interest and curiosity-based learning with intrinsic motives encourages pupils to seek help for learning new materials from the teachers and do school activities complying with the teacher demands. However, extrinsic motives like the desire to achieve good grades or please teachers often have negative relationships with their academic performance (Lemos et. al., 2014).

Different factors relevant to educational technology, like user-friendliness, users' curiosity for new learning tools, psychological satisfaction, and others effectively contribute to enhancing their intrinsic motivation in the long run rather than increasing extrinsic rewards, which are effective for a short-term basis (Areepattamannil et al., 2011). When learners find an educational technology helpful for attaining their goals, then the form of intrinsic motivation enhances markedly. The use of technology in active learning, which includes introducing collaborative project-based learning, in-group problem-solving sessions, use of in-class polling, peer teaching, multimedia content creation, and more can play a big role in enhancing the intrinsic motivation for students. For instance, the use of a classroom response system called 'Clickers' can contribute in improving the learning performance of students by positively influencing collaborative learning, engagement, and motivation (Blasco-Arcas et al., 2013). In this way, EdTech can help students make the transition from extrinsic rewards to intrinsic motivation of the learners to attain success.

Oudeyer et al. (2016) discussed how the brain can be intrinsically rewarded by complexity and novelty. They found that curiosity, and more generally the experience of

surprise and novelty, can enhance memory retention and learning. They also concluded that educational technologies can enhance students' experience of surprise, novelty, and intermediate complexity, and in this way can also enhance their intrinsic motivation to succeed.

Different educational applications on smartphones and tablets have played a major role in enhancing the learners' intrinsic motivation, curiosity, and learning. As argued by Papadakis and Kalogiannakis (2017), various educational applications for kindergarten kids and pre-schoolers motivate them intrinsically to be more involved in their own learning. Consequently, in classrooms where strong extrinsic rewards are offered to the learners for enhancing their motivation, EdTech can be successfully employed to enhance their intrinsic motivation to do better (Oudeyer et al., 2016).

Future Trends and Recommendations

A rapid and fundamental shift in educational practices has been observed in recent years, and this will shape future trends. Widespread adoption of technologies like Artificial Intelligence (AI), software tools, learning analytics, Machine Learning, and different social media applications are regularly being used by the learners and educators, and this trend will continue. AI-driven applications in education are being developed for future platforms and are still in their infancy (Jones, 2020). Endless learning materials will be available for future students, which will also be used to enhance their motivation significantly. It is recommended that more AI-based tools and applications need to be developed that will play important roles in enhancing the intrinsic motivation of the learners.

Considering the present perspectives when teachers are taking classes online due to pandemic, different methods will be followed by them to motivate their pupils to do better in future. Teachers and students will start to use different communication software tools more

like Zoom, Google Meet, See Saw, Slack etc. for communication. Also, new institutions will start offering online learning environments that will be welcomed by the students as they will be able to take those courses at their convenience, and also choose courses that interest them. These online platforms will also allow them to learn on their own to satisfy their curiosity and gain new skills. As opined by Hartnett et al. (2011), online learners are intrinsically motivated on the whole, hence it is expected that the online learning environments will enhance student's motivation in future as well. Effective steps need to be taken to make these tools more interactive and user-friendly to meet the needs of the future learners.

For next-generation education, chatbots are quickly becoming a fundamental tool. Chatbots provide a wide range of benefits, including self-paced learning, spaced interval learning, immediate feedback, and are designed to simplify the interaction between students and technology (Jones, 2020). This innovative technology is arming educators with new strategies for more engaged learning while simultaneously reducing their workload. Higher demand for video-based learning will come from students in the near future, even though most institutions are already incorporating video into their curricula in some way. Hence, the researchers and application developers need to come forward and try their best to develop new tools and technology that will meet future needs and will contribute towards enhancing the intrinsic motivation of students in future.

Conclusion

In this era of technological revolution, the use of EdTech is significantly increasing and well appreciated by the learners and teachers. Moreover, the application of the EdTech is no longer considered only for curiosity and fascination, rather it has become an essential part of the educational system. Based on the above discussion, it is evident that the use of EdTech accelerates student's intrinsic motivation and leads to higher academic achievements especially for elementary school students. It is expected that new and innovative tools and

technology will be used to make the learning process more interesting and enjoyable, and simultaneously enhance learner's motivation further in the coming days, which will also lead to better performance.

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