Intellectual Aptitudes Advancement among Senior High School Students by Integrating Technology and Innovation: Basis for Enhancement Program

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ABSTRACT

This research study discussed the impact of technological advancement and innovation in the modern educational setup in senior high schools. It was mentioned in this study the factors that could benefit the students with the presence of technology and how this will develop their intellectual capabilities. The objective of this study is to re-establish the ties between students and educational institutions and to stimulate students' enthusiasm for learning even while they are surrounded by technology or their valued possessions, such as their smartphones and gadgets. It was conducted among four public secondary high schools in Subic, Zambales that offer Senior High School curriculum during the school year of 2023-2024. The study utilized a descriptive qualitative research design, a survey questionnaire as a research instrument, and a thematic method for data analysis. Findings reveal that ICT integration in education forms a strong connection between teaching and learning and the course is strongly related to using learning tools in schools. Because kids are comfortable with technology and learn better in a technology-based environment, the topic of ICT integration in schools, particularly in the classroom, is critical. This is because the use of technology in education adds significantly to the pedagogical aspects in which the application of ICT will lead to successful learning with the assistance and support of ICT elements and components.

Keywords: intellectual aptitudes, enhancement program, technology advancement, technology integration, innovation

INTRODUCTION
Background
The capabilities of technology are quickly expanding, and it will continue to advance and become more integrated into our lives around the world. Students in today's world are far more technologically literate and advanced than those of previous generations. They learn to adapt to the way the world works with the assistance of technological advancements and innovative ideas. Technology is accelerating the pace at which the world changes and it unquestionably takes up the majority of the students' time and attention.

Students' minds will be raised, and their talents will be enhanced as a result of the integration of technology and innovation in education, which will not only recharge pupils but also prepare them to match the phase of the advanced world. Not only will it enhance the level of knowledge that students can gain, but it will also act as a stepping stone for the development of novel ideas that will be to the advantage of future generations. In addition to that, it has the potential to reestablish a link between the students and the educational process.

This initiative seeks to encourage all teaching and non-teaching professionals to develop/innovate school-based initiatives aimed at improving the teaching-learning process and school governance. Recent operations done by the Department of Education (Valenzuela Schools Division Office), encourage the integration of innovation in education as they implemented DepEd Memo No 3, s. 2022, which addresses "Guidelines for Conducting Innovation Projects in Schools." Aside from that, the DepEd (SDO - Capiz) also sponsored a competition to promote various school innovations using DepEd Memo 313, s. 2022. The competition was given the title "2022-2023 Educational Innovation Showdown," and it was participated in by all of the public-school teachers and non-teaching professionals from the division. By extending and enhancing the learning opportunities available to pupils, it seeks to address the rapidly shifting educational landscape.

On the other hand, research showed that the more dependent children are on technology, the less interest and significance they show in learning and grasping the content of their classes. They are better able to concentrate on whatever it is that they are doing on their mobile devices, laptops, desktop computers, and other social platforms, including social media. Because of these factors, a chasm is created between the students and the educational system.

Research Questions

This study aimed to determine how to enhance the intellectual capabilities of senior high school students residing in Subic, Zambales by integrating technology advancement and innovation in their subjects.

Specifically, it sought to answer the following questions:

1. What is the present status of technology and innovation in senior high schools?
2. What are the factors that could improve the capabilities of high school students by integrating technology and innovation in their subjects?
3. What are the factors that could lead to negative experiences in the integration of technology in the subjects of senior high school?
4. How can technological advancement and innovation affect the development of intellectual capabilities among learners?
5. What program can be developed to enhance the intellectual capabilities of the learners?

Scope and Limitation

This study focused on enhancing the intellectual capabilities of SHS students by integrating technology and innovation in their subjects. This study concentrated on students who are enrolled in both public and private schools in Subic, Zambales. This will be limited to students who have access to technology and are using devices or gadgets such as mobile phones, laptops, computers, etc.

This study did not cover other learners outside of Subic, Zambales, and students who don't have access to technology and do not own devices and gadgets such as mobile phones, laptops, gadgets, etc.

Each student was given the same assessment and evaluation to answer. The results of the study applied only to the participants of this research and were not used as a basis to measure the level of intellectual capabilities of other pupils outside the school.

RESEARCH METHODOLOGY

Research Design

A qualitative research approach was employed in this study, with the survey questionnaire as the principal research instrument. This was substantiated by the in-depth interviews and document analysis as supporting techniques to validate the results of this study.

According to Kirshenblatt-Gimblett (2006), the function of a research design is to ensure that the evidence obtained enables you to effectively address the research problem as unambiguously as possible. In social sciences research, obtaining evidence relevant to the research problem generally entails specifying the type of evidence needed to test a theory, evaluate a program, or accurately describe a phenomenon.

The research study described the result of the evaluation of the quality, usability, and potential effectiveness of enhancing the intellectual capabilities of SHS students by integrating technology advancement and innovation into their subjects. The observations and insights will be taken from the SHS participants.

Participants

The participants of this proposal were the Senior High School students from Subic, Zambales who are currently enrolled in public high schools. This study also focused on the students who have access to technology using a device or gadget and the internet.

Research Locale

The research study was conducted at Public Secondary Schools that offer Senior High Programs within Subic, Zambales.

In this research study, the Public High Schools from Subic, Zambales included Subic National High School, Sto. Tomas National High School, San Isidro High School, and Naugsol Integrated High School.

The Instrument

The main instrument that was used in gathering the data for the present study is a survey questionnaire which is partly adapted from the "Questionnaire on Learner Use of Technology" by Kirkwood, A. and Price, L. (2016). According to Sathiyaseelan (2015), questionnaires are the most frequently used instrument to collect data. It helps to gather data concerning knowledge, attitudes, opinions, facts, etc. It can be open-ended or closed-ended questions. The open-ended questions allow the subjects to give spontaneous opinions. In this type, the researcher has less control over the subjects' answers. Closed-ended questions allow subjects to select an answer from among several choices. The questions should be constructed using simple language and should signify one idea e.g.

Data Collection

Once the survey questions were validated by the experts, and after making the final draft of the survey checklist, the researcher sought the permission/approval of the Division Superintendent and School Principals of Senior High Schools in Subic, Zambales, through letters signed by the Researcher, Research Adviser and Director of Graduate School to administer the survey questionnaire to the participants.

After securing the endorsement, the researcher personally administered the interview to be conducted with the use of a recorder. The researcher will ask for the consent of every participant in using a recorder and this will be explained to them as "for documentation purposes to be used in research" only. As an application of the qualitative method, the researcher will gather the data using the conduct of interviews individually among the students. The objectives of the study will be explained to the participants, for them to consider and gain a better understanding of the objectives of the research study. The participants' answers were treated as confidential. The instruments were also collected immediately.

Data Analysis

The data that were gathered from the participants were documented, transcribed, and subject to thematic analysis. According to Villegas (2022), thematic analysis emphasizes identifying, analyzing, and interpreting qualitative data patterns.

Thematic analysis was widely used in the fields that use qualitative research methods. The researcher's first step in the analysis was to gather the data. After collecting all the necessary information, the researcher read the data from beginning to end. The next thing the researcher did was to code the text based on what it was about. Now that there is a set of initial codes, sort the codes into potential themes. After all the steps, the researcher was finally able to write the narrative to tell the story of the data.

RESULTS AND DISCUSSION

Frequency and Percentage Distribution of the Student-Participants' Profile

Table 2 shows the frequency and percentage distribution of the student participants as to their sex, grade level, strand, and school.

Table 2 Frequency and Percentage Distribution of the Student-Participants' Profile

Participants	Sex	Grade Level	Strand	School
1	F	11	GAS	Naugsol Integrated School
2	M	11	GAS	Naugsol Integrated School
3	F	12	GAS	Naugsol Integrated School
4	F	12	GAS	Naugsol Integrated School
5	F	11	GAS	Naugsol Integrated School
6	F	12	ABM	San Isidro High School
7	M	11	HUMSS	San Isidro High School
8	F	12	ABM	San Isidro High School
9	F	11	HUMSS	San Isidro High School
10	F	11	HUMSS	San Isidro High School
11	F	11	TVL	Sto Tomas National High School
12	F	11	TVL	Sto Tomas National High School
13	F	11	TVL	Sto Tomas National High School
14	M	11	TVL	Sto Tomas National High School
15	M	11	TVL	Sto Tomas National High School
16	F	11	STEM	Subic National High School
17	M	11	STEM	Subic National High School
18	M	11	STEM	Subic National High School
19	F	11	STEM	Subic National High School
20	M	11	STEM	Subic National High School

Sex. Of the 20 student participants, 7 are male and 13 are female. This means that most student participants in this study are represented mostly by women.

Grade Level of High School Students. There are 16 who are on the 11th grade and 4 are on the 12th grade student-participants.

Strands. Out of 20 student participants, 2 are under ABM; 5 are under GAS; 5 are under STEM, 5 are under TVL and 3 are under HUMSS.

Table 3 Status Of Technology and Innovation in Senior High Schools

SUB-THEMES	MAJOR THEME
ICT Ownership	Ownership and Access to the Internet and ICTs
Internet Access	
Hours Spent in Using the Internet	

ICT Ownership. According to the findings of the study, twenty of the thirty-six respondents have a mobile phone. This demonstrates how crucial and essential a cell phone is for a student to have in this day and age. Nine out of every twenty student participants own a laptop, whereas just three or four student participants have either a desktop computer or a tablet computer in their possession.

Based on the study conducted by Janssen (2020) current technologies are growing increasingly advanced and pervasive in many aspects of society, including individuals' personal lives. People can communicate swiftly, one-to-one and one-to-many, thanks to technology, and individuals can conduct their personal and professional lives entirely online. Students can also complete educational programs entirely online or through blended learning (face-to-face and online).

The development of technology has moved quickly forward across a wide variety of platforms and devices. Personal technology has become more compact, portable, convergent, and available twenty-four hours a day, seven days a week; in addition, the usage of this technology is no longer constrained by storage constraints (Khan, Stephen, & Petrina,2021). Users of multifunctional cell phones can access information from any location and at any time via the Internet; unlimited cloud storage is available; users can connect and communicate with specific family and friends via private email; users can also connect and communicate with a large number of other users via an ever-expanding variety of social media (Web 2.0, 3.0) platforms and applications. Multifunctional cell phones allow users to access information via the Internet from anywhere in the world, at any time.

Internet Access. Out of the 20 individuals, 14 use Wi-Fi to study, 13 use mobile data, 5 use the internet provided by the school, and 1 share their Hotspots with others.

90% of the information available on the internet was created in the last year. Students with having internet connection can stay up to speed on information that may not make it into their textbooks or may be out of date by the time it is made available in a more traditional format (James, G.-L., Bruillard, E., & Baron,2019).

According to the findings of Vlad (2020), when students were given the option to use technology to help them in their academic endeavors, their behavioral problems decreased.

Hours Spent in Using the Internet. Ten of the twenty student participants spend between 8 and 10 hours a week on the internet, while six spend between 5 and 7 hours, three spend between 2 and 4 hours, and two spend 11 hours or more. It appears that 10 spend anything between eight and ten hours every day on the internet.

Table 4 Usage Frequency of Social Media by the Student-Participants

SUB-THEMES	MAJOR THEME

Social Media Platform	Social Media Usage
Frequency of Updating Social Media	

Social Media Platform. According to the result, twenty percent of the student participants are active on Facebook and use Messenger. 17 people have accounts on Instagram, 10 people have profiles on Twitter, 5 people have accounts on TikTok, 2 people use Telegram, and the remaining 9 people have accounts on other social media platforms.

Calvin (2020) added that the use of social media in both the academic and personal lives of teachers and students is now almost unavoidable. However, many institutions of higher learning have been hovering around the use of social media by lecturers and students due to the widespread popularity of students' use of social media.

Frequency of Updating Social Media Platforms. Twelve of the individuals who responded indicated that they rarely updated their social media profiles or posted new content. 6 people indicate that they never publish anything on their social media accounts, while 3 people say that they occasionally post or update their social media accounts.

Klint (2020) states that alterations of many different kinds are being brought about because of the proliferation of information and communication technologies (ICT) throughout society. The educational setting, as a component of the social system, is not immune to the changes brought about by the incorporation of technologies. This is because education is a social system. In fact, for several years and from a variety of institutions, action plans have been established as a last resort to establish the appropriate use of these technologies--both in terms of didactic and practical application as well as those referred to its deontology--and thus to adapt to new social requirements.

Table 5 Factors That Can Improve Intellectual Capabilities

SUB-THEMES	MAJOR THEME
ICTs and Technologies in School	Positive-Personal Experiences
Presentation modalities	

The representation of the positive experiences that student participants had regarding an environment that was facilitated by technology is shown in Table 4. 18 respondents said that there was an adequate amount of information and communications technology (ICT) in their classes. They have televisions and projectors, and some of the teachers even have mics and lapels that they wear. 17 of the respondents indicated that they were granted permission to download and make use of free and open-source software for educational purposes. 16 of them indicated that they have permission to use and access the computer facilities at their schools. Some of the students who took part in the study noted that although their school has a large number of computers, they never get the opportunity to use them because of issues such as broken computers, a lack of extra space for a computer lab, and the fact that the computer lab is reserved for students in higher grade levels. 12 reported that they were able to access the school's wireless internet, albeit for a short amount of time.

The use of ICT in education shows a significant impact on students' perceptions of their academic performance Learning has been greatly transformed from the use of traditional methods to the adoption of

the use of smart mobile gadgets since the advent of information communication and technology in the late 1980s. However, motivation to use smart mobile gadgets is the desire and energy in students to be consistently interested and dedicated to making an effort to reach a goal through the use of smart mobile gadgets. Students must have this desire and energy to utilize smart mobile gadgets. According to Ling et al., (2020), a mobile device is also capable of communicating via the internet. It was believed that high-tech mobile devices, such as smartphones and tablets, would become the primary conduits via which new forms of world knowledge would be disseminated.

As discussed by Hwang, G. (2020) added that smart technology in the smart education system is an innovative educational environment of a higher school that emphasizes the application of technologies in scientific and educational activities of lecturers, scientific staff, and students to use and disseminate wide knowledge. Smartphones, tablets, and other similar devices are examples of "smart mobile gadgets," which are defined as "physical objects that interact with their environment and have an embedded processor, memory, sensors and/or actuators, and a network connection."

The representation displays the personal experiences of student participants on the advantages of utilizing technology in the classroom and the importance of continually inventing information and communication technologies (ICTs). 20 of the students surveyed said that they make use of Messenger to communicate and collaborate with both their teachers and classmates. 18 of the respondents expressed their agreement that receiving text messages from teachers regarding school updates and topics of study is beneficial. 16 of the students surveyed stated that the use of ICTs helps them perform better in their classes. While 15 of the respondents stated that information and communication technologies (ICTs) and technological advancements assist them in gaining a more in-depth understanding of their lectures and that it enables them to download materials or recordings of the discussions that they were unable to attend, the remaining participants did not make this claim.

The following statement was also seen in the study of Chantal (2020) wherein the study describes how the age of globalization, and having access to the internet has become increasingly important for enhancing human activities in a wide variety of domains, including economics, culture, defense, and a great many others; this is especially true in the context of education.

Microsoft Teams is an innovative online learning platform that offers a variety of one-of-a-kind features. These features boost the platform's potential to assist students in facilitating a better learning environment and engagement online.

It appears that the vast majority of college students favor in-person instruction over online instruction. This popular opinion was discovered in two surveys that were conducted not long ago by the EDUCAUSE Centre for Analysis and Research. The first one was published in October and polled approximately 40,000 students from 118 different universities in the United States. Seventy percent of the students who participated in the survey stated that they would rather learn in situations that are primarily or fully in-person. Even more popular than online classes are in-person ones, with 73 percent of the students who were asked to choose them. Despite this, approximately half of students, including those who opted for "mostly" face-to-face instruction, indicated a preference for the delivery of courses that incorporate components of both online education and education received in person.

As though the advent of ICT in education has seen a greater significant Mari (2020) study has shown the preference of students in terms of e-books and printed books in educational learning. Several researchers have tried to determine student's acceptance of e-textbooks with most of the studies focusing on the use of e-textbooks in libraries as opposed to actual classroom usage. The study has determined in recent years

that students have had a preference for using printed textbooks as opposed to electronic textbooks for classes.

Table 6 Benefits of Technology and Innovation

SUB-THEMES	MAJOR THEME
Positive Experiences	Advantages and Disadvantages of Technology
Negative Experiences	

The student-participant's negative experiences with the incorporation of technology into the educational setting are shown in the representation. 15 people out of a total of 130 respondents stated that they are more engaged in topics that deal with technology and that they have a tendency to become bored when there is no involvement of technology in a certain topic. 15 students out of the total number of respondents shared their opinion that their instructors should implement more complex methods into their lessons. Thirteen of the students stated that they are not yet technologically ready to start college since they do not yet possess the requisite skills and capabilities when it comes to technology skills.

The following statement can have a theme of connectivity in terms of using ICT services in educational set-up. Hugh, N. (2020) study highlights the significant advances in educational technology that have been made in recent years, and as a result, it is now possible to assess the effects of technology integration on communication. Furthermore, the value of technology in facilitating communication between instructors and students cannot be emphasized. According to Vincentas (2021), the use of appropriate computer technology and the Internet is frequently associated with information technologies in education. According to Christensen (2022), research has shown that needs-based education that incorporates technology has a rapid and good influence on teacher attitudes, particularly concerning computer anxiety, perceived significance of computers, and computer enjoyment. Increased spending on information and communication technology infrastructure, equipment, and professional development has resulted from initiatives to improve education in many countries. Despite these investments, however, classroom adoption and integration of information and communication technology have remained limited (Andoh, 2021).

Educators are always on the lookout for new technological resources that will help them improve their students' educational experiences. However, technology is now recognized as a vital resource in schools and has been shown to boost students' ability to learn. However, this has a detrimental effect on the education of the students. Education is rapidly moving towards becoming independent of both time and place due to advances in information technology. However, for a learner to be successful throughout their whole educational journey, they must have access to a network of resources and support. Students cannot succeed without the support of their parents, friends, as well as those who double as instructors and mentors. According to Hakim, M., Ellram, L. M., Siferd, S. P., & Salik, S. (2020), the purpose of the movement is to "mobilize understanding and support" to provide students with the opportunity to cultivate the abilities, routines, values, and understandings necessary for productivity in all occupations throughout their lives.

Table 7 Technology Advancement on Intellectual Capabilities

SUB-THEMES	MAJOR THEME

Advance Technology	Development of Intellectual Capacities with ICTs involved
Faster Internet	
Number of ICTs available	
Internet Access to All	
Conducive Technology-Enabled Learning Environment	

The representation displays the thoughts and opinions of the students who participated in the study regarding the degree to which their respective educational institutions require additional technological development. 20 people thought that it was essential for every student to have access to the internet to improve the learning environment at each school. 16 of the students believe that increasing the quantity of computers that are available for usage will help to improve their education. 15 of the respondents indicated that having faster internet as well as seminars and programs will assist improve the overall learning environment. 10 people said that the introduction of modern technologies will improve the learning environment and help introduce technology into education. Lastly, eight people said that a favorable learning environment that is enabled by technology also contributes to the improvement that is required; this includes rooms with air conditioning and quiet places to study.

Technology is very important in the lives of today's students. Technology integration in educational contexts has been proven to have a good impact, but it is not without drawbacks. Technology has enhanced students' willingness and participation, making it feasible to improve their educational experience. In the words of Fisher, M. N. K., Maramba, I., & Wheeler, S. (2018), "The need for construction and engagement means that the best types of learning will be those that involve choices that the student can make, and learning where there are meaningful contexts where the student is engaged. In other words, the most effective kinds of education will be those that allow students to develop their knowledge and actively participate in the process of doing so.

CONCLUSIONS

Based on the results of the study, the researcher concluded that the participants are mostly female students, the majority are Grade 11 which are scattered on strands STEM, GAS, and TVL strands. In addition, all the participants owned mobile phones, had social media, and had access to the internet. Each of the participants possessed a mobile phone, was active on at least one social media platform, and had internet access. There is no discernible change in the identified degree of agreement of student participants on their responses regarding mobile phones when they are classified according to the devices they now own.

The identified level of agreement of student participants on their experiences as to ownership and access to the internet and ICTs differs significantly when categorized according to ICT ownership, internet access, and hours spent using the internet. There is also a substantial difference in the number of hours spent using the internet.

When the student participants were broken down into groups based on the various social media platforms, there was no discernible difference in the identified level of agreement between their comments on Facebook and Messenger. Furthermore, when student participants are grouped according to the positive personal experience of student participants in technology-enabled learning environments, there is a

significant difference in the identified level of agreement of student participants on their experiences with classroom facilities (SMART Board, Television, Mic, Projectors, etc.).

There is a significant difference in the identified level of agreement among student participants on their experiences in classroom facilities. When the student-participants were grouped according to their personal experiences on the benefits of using technology in education and on continuously innovating the ICTs, there was a significant difference in the identified level of agreement of student-participants on their experiences as to use of instant messaging/chat on the web to communicate/collaborate with other students and teachers in the school. This difference was significant.

There is a significant gap in the identified level of agreement among student-participants on their experiences as to have been interested only in subjects that involve technology and who wish to have their teachers level up their teaching with the involvement of ICT when grouped according to the negative-personal experience of student-participants on the integration of technology in education. Hence, there is a higher proportion of student participants who have had a positive personal experience with the integration of technology in education. The identified level of agreement of student-participants on their experiences as to special programs to integrate ICT in the curriculum is significantly different when categorized according to programs that can boost the intellectual capacities of the learners. This finding reveals a considerable disparity between the two sets of programs.

RECOMMENDATIONS

Concerning the preceding conclusions of the study, the following recommendations were made. Schools through teachers may extend their time on orienting/explaining the importance, uses, and benefits of technology and innovation in education for Senior High School students. School heads and teachers could become aware of the importance of having a conducive technology-enabled learning environment. In addition, schools may provide more modern, technical, and beneficial materials to each class. Teachers can maximize the time students spend experiencing each device (computers, laptops, tablets. etc.) offered by schools if it is used for learning and mastering skills.

Furthermore, schools may grant internet access to students for the convenience of studying anywhere in the school if there is encryption to avoid any unnecessary searches. Schools through teachers may expand their service to students to provide advanced teaching strategies involving ICTs and technology. Teachers further emphasize in their lessons the use of ICTs and integrate technology and innovation in their lessons. Schools may allow each student to have "one student, one computer" to allow them to navigate the computer on their own and allow them to experience and explore its uses.

Aside from the above-mentioned, it is recommendable to make additional resources available to ensure access to the internet that is reliable. Allocate funding for the purchase of mobile hotspots that may be used by individual students, and make sure there are secure areas on campus where students can use the internet whenever they find it necessary to do so. The number of access points in student housing and public areas of the campus should be increased, and directional antennas should be installed to improve signal strength. To better assist students who need internet connectivity at home, financial aid packages should be expanded to include funding for internet access upgrades or additions.

Additionally, schools should encourage teachers to assume that their students do not have enough connections. Train faculty members on asynchronous and low-bandwidth educational approaches, such as recording lectures and content, so that students have the added flexibility that can handle the internet access challenges that so many of them experience while working and learning from home. It is also

notable to boost the number of campus technology support services available for connecting devices to the internet and increase the visibility of these services. Promoting services through several channels, such as emails sent out by the university, social media, advisers, faculty members, and the learning management system (LMS), is one way to raise the level of student awareness. Ask teachers to include this information in the course syllabi and place support information in a prominent location on IT websites and learning management system sites.

Lastly, future researchers may conduct a follow-up study on students' experiences in other municipalities as to how they view and think of integrating technology and innovation in their education.

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