

Effect Of BOPPPS Model In Social Science With Digital Quotient On Secondary School Students

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ABSTRACT

Background: BOPPPS (bridge-in, learning objective, pretest, participatory learning, posttest, and summary) is a student-centered modular teaching model that improves classroom teaching effectiveness. This study's primary aim was to find out whether the BOPPPS model in social science as advantages over traditional method in relation with Digital Quotient.

Methods: A total of 60 students of class IXth was participated in the study, were divided into two groups, receiving the same civics teaching content. The experimental group ($n=30$) utilized the BOPPPS model, while the control group ($n=30$) used the traditional teaching method. An achievement test was prepared to attain the students' scores after 15 days. The digital quotient scale was developed by researcher and got validated by the experts and then item analysis of the scale was done. Then the final draft of scale was given to both the groups.

Results: The experimental group's achievement test scores with the BOPPPS teaching model were significantly higher than those in the control group. Students preferred the BOPPPS model more than the traditional method. The Pearson coefficient (r) shows strong positive relationship between achievement test and digital quotient ($p<0.05$).

Conclusions: The BOPPPS model demonstrates significant advantages over traditional teaching methods in enhancing students' academic performance in social science. The model's structured, interactive approach not only improves learning outcomes but also fosters better communication skills and student engagement. The positive correlation between Digital Quotient and academic achievement further highlights the importance of digital literacy in modern education.

Keywords: BOPPPS model, Traditional Method, Digital Quotient, Academic achievement.

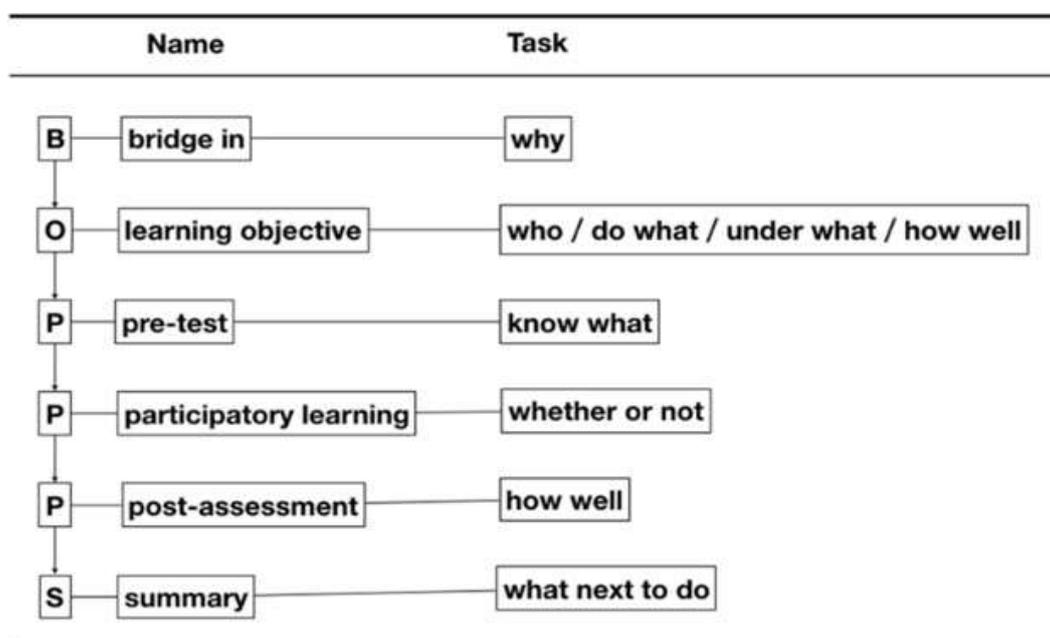
Introduction

In the rapidly evolving digital age, integrating effective pedagogical models with digital literacy is crucial for enhancing educational outcomes. One such model that has gained traction is the BOPPPS (Bridge-in, Objective, Pre-assessment, Participatory Learning, Post-assessment, Summary) instructional model. This article explores the impact of the BOPPPS model on social science education among secondary school students, with a particular focus on the influence of digital quotient (DQ). (Boughzala et al., 2020)

Education is the process of advancement and provides equal chances to all. It enriches the individual to extend knowledge and advance in discovering novel ideas and means of learning. It is the channel between "existing knowledge" and "evolving knowledge". Knowledge is a relational aspect of education and is directly related to the richness of the learning experience provided to students. Education has a very vast sphere, including each and every aspect of human life. It is the most important means for person to enhance their overall personality by improving their capabilities and their opportunities through— Acquisition, creation, application, information, communication, participation, adaptation, assimilation, etc. According to John Dewey, "education involves the transmission of habits, ideals, hopes, expectations, standards, and opinions from one generation to the next." (Downes & Rock, 2014)

The lesson plan is the “travel guide” or “road map” to the lesson that you deliver in class. It contains the structure, sequence, and materials needed to get from the beginning to the end of the lesson. Use an intentional structure, like the BOPPPS model, to help navigate this journey. Effective lesson planning is the greatest tool in your teaching toolkit. In this teaching tip, learn about the BOPPPS lesson plan and find downloadable resources to help you apply this strategy for face-to-face and remote lesson delivery. The BOPPPS teaching model is designed by Canadian Teacher Skills Training and is based on the qualifications of teachers in British Columbia, Canada. It is mainly used for the skill training of teachers. In training, the teaching practice is to use the leading method to enhance the teaching of teachers. The effectiveness of skills and teaching is the aim of this model. So the skills of a teacher can be measured in the classroom by the strategies of this model. This model lesson plan will be developed by the researcher to create an interesting and effective environment for the learner in a constructive way.(Fan et al., 2020)

In the BOPPPS model, a class is divided into six sessions—Bridge-in, Objective/Outcome, Pre-assessment, Participatory Learning, Post-assessment, and Summary—each lasting about 15 minutes, which resembles minutes. micro-lecture. It is based on the theory that a Person’s attention span lasts only 15minutes.(Zhang, 2023) (Fig-1)



- Bridge-in:** Engages students and connects the lesson to prior knowledge or experiences.
- Objective:** Clearly states the learning goals for the session.
- Pre-assessment:** Gauges students' existing knowledge and readiness.
- Participatory Learning:** Involves students actively in the learning process through discussions, activities, and collaborative tasks.
- Post-assessment:** Measures the extent of learning and understanding.
- Summary:** Recaps key points and consolidates learning.

The development of the self—identity, personality, method of communication, skills, and talents—will eventually all happen together with technology and the internet. Preparing for generation of tomorrow, it has become more than just about teaching the basics of language, mathematics, history, or geography; it has also become about the (safe and healthy) use of technology.(Wu et al., 2023)

From IQ (intelligence quotient) to EQ (emotional quotient), we have now come to the age of DQ (digital quotient). Supporting the children's digital learning and understanding of the benefits and risks of digital allows them to grow up fully equipped to navigate the digital world.Many people assume that Quotient has to do with the skills you need to use technology effectively, but, colloquially speaking, DQ is just a measure of how you’re doing on digital. The acronym was coined by the DQ Institute in 2016 and is essentially the sum of cognitive, emotional, and social abilities that enable us to deal with the challenges of a digital world.(Boughzala et al., 2020)

The digital quotient is a measure of the digital competence of children. In present scenario, technical/technological world is rapidly evolving with the continuing developments in digital age that we live in, our children have solid mastery of the internet, smartphones, social media, and regular evolving digital platforms.

Digital quotient refers to the set of skills and competencies that enable individuals to thrive in a digital environment. For students, a high DQ includes proficiency in digital tools, critical thinking in digital contexts,

online safety, and digital citizenship. Integrating DQ into education ensures that students are not only consumers of digital content but also responsible and skilled digital citizens.

Methodology

To evaluate the effect of the BOPPPS model on social science learning with DQ integration, a study was conducted involving 9th class secondary school students. The study used a quasi-experimental design with two groups: an experimental group that received instruction through the BOPPPS model integrated with DQ elements and a control group that followed traditional teaching methods.

Participants: The study involved 30 students in each group. The selection of participants for experimental group is based on the previous class (8th) academic marks in social science.

Procedure: Digital quotient Scale is developed to gauge digital efficiency of the students. It consists of various aspects like- digital capabilities, digital awareness, internet using, access of data, digital learning, digital knowledge, digital performance and digital competency etc. this scale has been developed by the researcher itself for the 14-18 age group students. The purpose of the scale is to see how students comprehend digital technology, process their learning and develop digital capabilities in productive way. To examine the response of respondents on 5 scale score from (a) strongly agree, (B) agree, (c) neutral, (d) disagree (e) strongly disagree. To develop this scale, the researcher applied the steps to transform into standardized way.

Preparation of the preliminary draft Stage-1

Literature review on the digital quotient

The researcher studies the various literatures on the digital quotient and also the construction of the tools also. Digital quotient is comprising of various dimensions- digital awareness, digital capability, uses of internet, applications of digital tool, digital learning etc. the investigator go through the literature on the various dimensions which provides an outlook to know about dimensions to frame the statements for the particular sample.

Framing of items

After the review of literature and the supervisor guidance the researcher framed the items on the digital quotient scale for secondary school students. In the time of framing the items the researcher has been guided by the supervisor in such way-

1. The statement should be easy and understandable for the sample.
2. It should be precise.
3. It should not be ambiguous
4. There should be no double meaning statements.
5. It should be content oriented

Stage-2

Content validation by the experts-

After the guidance of the supervisor and review of literature the researcher developed 67 items and keen expertise of the supervisor it has been examined and transformed into 47 items for the expert advice. The digital quotient scale comprises of 47 items in which 34 items were positive and 13 items were negative has been send for the expert comments of the various department. The researcher got their reviews and done implications on it then applied it in the field for the purpose of the study.

Stage-3

i.Small try out

After to get review on the digital quotient scale the researcher applied this scale on the particular sample to get the responses of the students whether they are able to understand the statements without any difficulty or have any issues regarding to know the meaning of words. The researcher secured their views and does minimal changes regarding words. This try out has been performed on the 50 students of Navyug senior secondary school.

ii. Large try out

To get the responses of the students on the digital quotient the researcher tried this test on the large sample to know the brooder look of this scale. The researcher applied it on the 248 samples of CBSE school students of 9th grade and recorded the scores of students on the particular statement

Scoring: This scale consists of (30) Statements on a (5) point scale with (21) positive and 9 negative statements. The answers has been capitulated as (a) strongly agree, (B) agree, (c) neutral, (d)disagree (e) strongly disagree raised a reference point of 5,4,3,2,1 respectively for the positive statement and the negative responses calculated as 1,2,3,4,5. The types of various items and its scoring procedure are shown in the table 1.1 and figure 1.2 respectively.

Table 1.1 The positive and the negative items

| Sr.No. | Types of statements | No. Of statements | Total no of items |
|--------|---------------------|--|-------------------|
| 1. | Positive | 1,2,4,6,7,8,9,10,11,12,13,14,15,16,17,19,20,21,22,23,25,26,27,28,29,30,31,32,35,37,38,42,44,47 | 34 |
| 2. | Negative | 3,5,18,24,33,34,36,39,40,41,43,45,46 | 13 |

Table 1.2 Scoring procedure of the Digital Quotient scale

| Sr. No. | Statements | positive | negative |
|---------|-------------------|----------|----------|
| 1. | Strongly agree | 5 | 1 |
| 2. | Agree | 4 | 2 |
| 3. | Neutral | 3 | 3 |
| 4. | Disagree | 2 | 4 |
| 5. | Strongly disagree | 1 | 5 |

Stage- 4**Standardization of the tool****Item analysis of the scale**

It's one of the most prominent step to examine the truthfulness of the each and every statement for the standardization of the tool. It has been examined after the collection of the responses of the students in the statements. Reliability and the validity of the test have been also checked. Item analysis can be checked in the booth way qualitatively and quantitatively also through statistical implied and content validation. Item difficulty can be measured through percentage so its not appropriate to measure a scale. The researcher applied discrimination indices for the item analysis

Inter term discrimination

Inter term discrimination is used to find out the difference between the scores of higher group and lower group. For this the whole data managed into descending order and turned into two groups the 67% upper group And 67% lower group to distinguish the items which significant to retained and other one were no significant to remove. This has been performed to get the differences between the two groups. The table has been in which the differences between the groups has been checked through their mean score and t value for item discrimination.

Table 1.3 Final draft of the Digital quotient scale

| Sr. No. | variable | dimensions | Item no | Total |
|---------|------------------------|----------------------|-------------------|-------|
| 1. | Digital quotient scale | Digital capabilities | 4,32,34,41 | 4 |
| 2. | | Digital awareness | 25,27 | 2 |
| 3 | | Internet using | 28,31,35 | 3 |
| 4 | | Access of data | 15,37 | 2 |
| 5 | | Digital learning | 5,6,7,18,38,39,47 | 7 |
| 6 | | Digital knowledge | 9,14,24,42,46 | 5 |
| 7 | | Digital performance | 10,11,19,40 | 3 |
| 8 | | Digital competency | 2,36,44 | 3 |
| TOTAL | | | | 30 |

Achievement test is a standardized tool constructed to measure the knowledge, skills learned by the pupils of particular grade level. Achievement test applied in the education to determine the level of the instruction provided in the classroom and the scores obtained by the students. This test at the initial stage at 20 items comprises of multiple choice questions from the selected 2 chapters of civics of social science. The instructor selected NCERT book of 9th grade student for the construction of the items. The time allotted – 40min for the test. This achievement in social science administrated on both the experimental group and control group.

The researcher has been prepared the lesson plans in social science based upon BOPPPS Model developed by the researcher – a treatment tool of the experimental group. It does can be measure as democratic and an interactive model for the learners according to their age group as well as prescribed books of social science recommended by the NCERT for senior secondary school students. In this process instructors delivered their lessons plan as according to the BOPPPS lesson plan. The researcher constructed the lesson plan of social science. In this lesson plan researcher selected civics 2 chapters of social science- in which each chapter of the unit contained five lesson plan. In such way instructor developed 2(chapters)*5(lesson plan) = 10 (Total lesson plans) for 15 days' treatment. These lesson plans comprise in such a way to draw out maximum output of the learning. Instructor use NCERT books as the material for the content matter in the subject of social science for 9 th students. BOPPPS lesson has been developed by the researcher, validated by the experts, the suggested changes have been employed and then applied on the sample.

Statistical techniques used:

1. To study the feature of data relevant descriptive statistics were applied.
2. T-test applied to compare the academic achievement in social science in both the groups.
3. The Pearson coefficient of relationship employed to check the relationship between academic achievement and digital quotient within the group.

All statistical analyses were performed using the SPSS version 17.0 software. The measurement data were expressed as mean ± standard deviation ($\bar{x} \pm s$). Significance was assessed from an independent sample *t*-test. Statistical significance was set as $p < 0.05$. The present study deals with Effect of BOPPPS Model in social science with Digital quotient on Secondary School students. Total 60 subjects were participated in the study.

Results

Level of significance for both the groups academic achievement and Digital Quotient

GROUP1AA and GROUP2AA reveals distinct differences in their central tendencies and variability. GROUP1AA shows a higher mean and lower variability, indicating a more concentrated distribution around its mean of 33.80. In contrast, GROUP2AA has a lower mean and higher variability, suggesting a broader distribution of data points around its mean of 20.00.

GROUP1DQ and GROUP2DQ highlights significant differences in their central tendencies and variability. GROUP1DQ exhibits a higher mean and lower variability, indicating a more concentrated distribution of data points around its mean of 179.43. In contrast, GROUP2DQ has a lower mean and higher variability, suggesting a broader distribution of data points around its mean of 141.63.

Table 1.4 Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|----|---------|---------|--------|----------------|
| GROUP1DQ | 30 | 170 | 199 | 179.43 | 8.220 |
| GROUP1AA | 30 | 30 | 38 | 33.80 | 1.919 |
| GROUP2DQ | 30 | 120 | 164 | 141.63 | 14.050 |
| GROUP2AA | 30 | 10 | 24 | 20.00 | 3.714 |
| Valid N (listwise) | 30 | | | | |

Comparison of test scores between the two groups

The *t*-value for the comparison is 18.081, which is highly significant ($p = .008$). This indicates a substantial difference in scores between the experimental and control groups. The mean score difference of 13.80 (33.80 - 20.00) suggests that the intervention implemented in the experimental group led to significantly higher scores compared to the control group.

Table 1.5 Comparison of test scores between the two groups

| Group | Experimental group (n=30) | Control group (n=30) | t-value | p-value |
|--------|---------------------------|----------------------|---------|---------|
| Scores | 33.80±1.919 | 20.00±3.714 | 18.081 | .008 |

The correlation coefficient (*r*) of 0.63 indicates a moderately strong positive relationship between achievement test scores and Digital Quotient (DQ). This suggests that higher levels of DQ are associated with higher achievement test scores among the participants.

Table 1.6 Correlations between group A digital quotient and Academic achievement

| | | GROUP1 AA | GROUP1 DQ |
|---------|---------------------|-----------|-----------|
| GROUP1A | Pearson Correlation | 1 | .063 |
| | Sig. (2-tailed) | | .743 |
| | N | 30 | 30 |
| GROUP1Q | Pearson Correlation | .063 | 1 |
| | Sig. (2-tailed) | .743 | |
| | N | 30 | 30 |

The correlation coefficient (*r*) of 0.83 indicates a very strong positive relationship between achievement test scores and Digital Quotient (DQ). This suggests that higher levels of DQ are highly associated with higher achievement test scores among the participants.

Table 1.7 Correlations between group A digital quotient and Academic achievement Correlations

| | | GROUP2DQ | GROUP2AA |
|---------|---------------------|----------|----------|
| GROUP2Q | Pearson Correlation | 1 | .083 |
| | Sig. (2-tailed) | | .662 |
| | N | 30 | 30 |

| | | | |
|---------|---------------------|------|----|
| GROUP2A | Pearson Correlation | .083 | 1 |
| | Sig. (2-tailed) | .662 | |
| | N | 30 | 30 |

Discussion

The BOPPPS model is a student-centered teaching method and observation system adopted by many famous colleges and universities in recent years. This teaching method has incomparable advantages over traditional teaching methods in terms of stimulating students' learning interest and enthusiasm and improving teaching efficiency, which is consistent with this study's results. (Wang, 2020)

The results of this study showed that the BOPPPS model was significantly better than the traditional instructional approach in the aspects of student–teacher interaction, learning initiative, analytical ability, clinical thinking ability, and self-study ability. Participatory learning is the core part of this teaching model. Teachers can guide students to discuss topics related to the course actively, find problems, and solve problems, effectively improving teaching effectiveness. Additionally, teachers can also obtain feedback information from students in time to adjust subsequent teaching activities. (Fan et al., 2020) The BOPPPS model can fully inspire students' enthusiasm for studying and guide them to solve problems on their initiative. Simultaneously, it can also improve students' thinking ability and cultivate students' independent learning and communication and cooperation ability. Therefore, the BOPPPS model should be applied selectively according to the content of the course and based on the students' knowledge background. (Shih & Tsai, 2020)

Finally, the BOPPPS model should be an open instructional design model. Teachers should integrate their rich teaching experience into daily instructional practice on the basis of abiding by the BOPPPS teaching model. We should adjust the instructional design according to the instructional content and students' foundation to make it more in line with students' psychological characteristics and cognitive laws. (Ma et al., 2022)

The digital quotient is comprising several components like digital capabilities, digital awareness, internet using, access of data, digital learning, digital knowledge, digital performance and digital competency etc. Correlation analyses further explored the relationship between achievement scores and DQ levels within each group. Group A exhibited a moderately positive correlation between achievement and DQ scores, indicating that higher DQ levels were associated with better academic performance. This finding supports the notion that digital literacy skills are beneficial in facilitating learning and comprehension in diverse subjects. In contrast, Group B showed a weaker correlation between achievement and DQ scores. (Mehrabi & Goodarzi, 2019)

This suggests that while DQ may have some influence on academic outcomes, its impact is less pronounced without the supportive framework provided by the BOPPPS model. The findings highlight the interactive effects of pedagogical methods and digital competencies on student learning. (Holm, 2024)

Conclusion

In the present study, we compared the effects of the BOPPPS model and traditional teaching methods in social science, incorporating the concept of Digital Quotient (DQ). Our findings indicate that students' overall scores in courses using traditional methods were lower than those of students who were taught using the BOPPPS model. The BOPPPS model appears to stimulate students' interest in learning, enhance their understanding and memory, and improve their communication skills through increased interaction with teachers and classmates via teamwork.

The results suggest that the BOPPPS model is superior to traditional methods in terms of overall teaching effectiveness. With continued exploration and refinement, the BOPPPS model has the potential to play a more significant role in teaching reform, ultimately improving teaching effectiveness and quality. Additionally, the study found a significant correlation between academic achievement in social science and digital quotient, within the experimental group and control group, further emphasizing the importance of digital literacy in academic success. These findings underscore the value of integrating innovative teaching models and digital skills training to enhance educational outcomes.

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