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# Comparative Study of Teachers and Students Perceptions towards Science Technology Society and Environment (STSE) Approach

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**Abstract:** *The main aim of this study was to compare the perceptions of secondary school science teachers and students towards Science, Technology, Society and Environment (STSE) approach. Quantitative survey design was used to investigate the problem. The population of the study consisted of all Government secondary school science teachers and students in the tehsil Adenzai. By using stratified sampling technique 90 science teachers and 737 science students were randomly selected for this study. A self-developed questionnaire consisted of multiple scales were used to collect data from the respondents. The study results show significant differences between the perceptions of science teachers and students regarding the concept of STSE approach, required training skills, social context of science, and usefulness of STSE approach for teaching of science. Rank order, frequency and percentage scores showed no difference between the perceptions of science teachers and students regarding aim of science education, hindering challenges in STSE approach and suggestions and recommendations for the implementation of STSE approach. It was recommended that science curriculum may be developed on the basis of STSE approach and science teachers may properly be trained to implement this approach in classroom for teaching science subjects*

## Introduction

In the twenty-first century, technology has evolved into a powerful force in society that both influences and is influenced by society. In this situation, a successful STSE integrated approach can provide a huge chance to thoroughly investigate the ethical and ontological questions of science, society, culture, and the individual in the context of mankind living in a technological civilization. STSE have been around for more than half a century, bringing with them a wealth of knowledge and proven research experiences. This integrated approach can provide more options for better science curriculum building that differs from typical-teacher-student-subject-matter arrangements and the contexts in which science learning occurs (Ball, 2012).

Position and effect of science and technology in social life can be understood by STSE approach. STSE refers to teaching and learning of science in the context of daily life experiences (Zoller, 2000). STSE helps to understand the relations of science, technology and individual life. Yegar (1996) opined that STSE is an attractive and interesting approach which facilitates learning process for students.

Through this approach science teachers try to accomplish science teaching objectives in classroom (Lee & Erdogan, 2007).

The fundamental goal of science education is to equip students to be scientifically literate by teaching them to be critical thinkers who are also responsible for a variety of STSE concerns in science (Kolsto, 2001). He further stated that students must be aware of several opinions on a scientific subject before forming their own beliefs, that influenced by socio-cultural factors. As a result, using this approach help the students to understand the social context in which science occurs becomes critical. It is important to not undervalue the possible benefits of discussing STSE concerns in science classes and the relationship to a rich framework for scientific inquiry. Science courses often focus on knowledge development in terms of acquiring new concepts, leaving limited area for original thought, challenging ideas, and/or debate. The inclusion of STSE topics in science lessons enables students to apply scientific ideas to the analysis of real-world problems, which in turn enables the development of cognitive abilities.

According to Zeidler, Keefer, and Abd-el-Khalid (2003) socially relevant scientific concerns draw students in, promote moral and ethical reflection, and aid in the whole development of pupils, including their cognitive abilities. If students can adapt and employ the concepts and skills on their own in new circumstances, this is actual evidence of learning. Yeager and Dweck (2012), highlighting the significance of cognitive development through creative thinking abilities. Learning of independent scientific concepts is encouraged by contextual factors related to scientific learning. According to Zeidler et al., (2009), when social issues are used as a background, students are more likely to find them personally relevant and approachable.

Although there are several options to use socio-scientific concerns in science lectures, STSE-based subjects appear to be limited in science classroom since science teachers are typically hesitant to introduce challenging and debatable social issues rooted in science domains. Because STSE-based topics necessitate knowledge outside the science content basis, teachers and students are generally receptive to issue-based education within traditional science pedagogy (Hughes, 2000). In other words, teaching STSE-related subjects necessitates an interdisciplinary approach to science education, in which the overlap between scientific concepts and society is recognized and explored.

Teachers face structural hurdles when conducting issue-based class discussions. Teachers in high school classrooms who want to teach an overcrowded science class encounter a number of challenges, including huge class sizes, overcrowded curriculum, and handling new curricular content (Hughes, 2000). Large class sizes limit students' ability to express their thoughts and ideas. Even when the teacher facilitates and encourages students to participate in conversation, there is less chance for all students to convey their perspectives in such huge courses (Levinson, 2006). Science teachers are hesitant to incorporate socio-scientific topics into their classes because they are afraid of getting lost the theoretical body of scientific knowledge. According to Hughes (2000), when there is considerable treatment of social science topics, teachers grow concerned that the pure science content within the science curriculum would be neglected.

## Statement of the Problem

Science students rarely perceive their studies as being relevant to or applicable to their own life in actual science courses. The input of teachers and their views or beliefs regarding such innovations are now key factors in the implementation of STSE in science courses. Science teaching within the STSE paradigm is created by the teacher and the students working together, or it is created by student recommendations based on their interests and current problems in their lives.

Therefore, it is crucial to take students' opinions, interests, and attitudes into account while creating science courses. The biggest factor in the change to STSE education is science teachers. A science teacher must, therefore, have a thorough understanding of STSE education and the theory underlying it for a change to be successful. For instance, Noss and Hoyles (1996) contend that any innovation that is implemented without taking into consideration the teachers, students, and their workplace circumstances as facilitators of the innovation is likely to fail. Mansour (2007) and Waks, (1987) stated that STSE education's main goal is to give students a contextual understanding of modern science and technology as well as the intellectual groundwork for responsible citizenship. The emphasis on the connections between science, technology, society, and the environment within STSE in science education has necessitated a focus on science-related social and environmental issues. STSE is necessary to give students the tools they need to become active citizens (Kolstoe, 2001). It is obvious that the STSE approach is valued by the science education community when it is incorporated into science education programmes. Therefore, it is worth to raising question: what are science teachers and students' beliefs concerning the STSE approach and related issues? This is what this study had focused on.

## Research Objectives

The objective of the study was to compare the perceptions of science teachers and students towards STSE approach in High/Higher Secondary Schools of Lower Dir. Based on this research objective the following research question sought to be answered.

1. Is there any significant difference between the perceptions of science teachers and students of government secondary schools regarding STSE, challenges faced by them and its applications?

## Research Methodology

The current study used quantitative approach to get the answer of the above mentioned question. Descriptive (survey) method was used to collect and analyze the data. The population of the study included all the secondary school science teachers and students in district Dir Lower. The researchers selected 90 science teachers (50 male and 40 female) and 737 science students (400 boys and 337 girls) from 41 secondary schools of tehsil Adenzai through simple random sampling method.

Data was collected through using the questionnaire based on review of related literature for measuring/knowing the opinions of science teachers towards STSE approach. The opinions of students were crossly verified through same questionnaire. The questionnaire was developed on the basis of various scales like Likert, Semantic differential, rating and Thurstone. The rational of using various was to make the questionnaire easy and interesting for respondents and enhances its validity and reliability. After establishing the face and content validity of the instrument was piloted with the same identical science teachers and students in the sample. The experts were asked to fill the questionnaire and point out the ambiguity in the items or in directions. Through Cronbach alpha α, the reliability of the instrument was established. The Cronbach alpha value for the questionnaire was found 0.84, which was found higher than that of threshold frequency.

## Data Analysis

As nature of the study was quantitative, therefore, data were analyzed by using SPSS. Perceptions of teachers and students were compared using independent sample t-test. Collected data was entered into spread sheet and was analyzed as:

- Comparison between the overall opinion of teachers and students regarding STSE approach

Table shows the differences between the perceptions of teachers and students. Collected data was analyzed using independent t-test sample for the given statements.

**Table 1.** Comparison between the perceptions of science teachers and students regarding the STSE approach

| *Statements* | *R* | *N* | *M* | *SD* | *Std. Error Mean* | *t* | *p* |
|---|---|---|---|---|---|---|---|
| Understanding the concept of STSE in the local learning context | Teachers | 90 | 2.82 | .488 | .051 | 2.05 | .040 |
| | Students | 737 | 2.91 | .357 | .013 | | |
| My teacher have tried to teach this way | Teachers | 90 | 2.49 | .753 | .079 | 8.22 | .000 |
| | Students | 737 | 2.90 | .390 | .014 | | |
| I want to learn in this way | Teachers | 90 | 2.89 | .390 | .043 | .749 | .454 |
| | Students | 737 | 2.92 | .330 | .012 | | |
| Not convincing that it is the best approach for my country | Teachers | 90 | 2.23 | .765 | .081 | 5.65 | .000 |
| | Students | 737 | 2.64 | .622 | .023 | | |
| Limited time makes this concept impracticable | Teachers | 90 | 1.99 | .814 | .086 | .329 | .742 |
| | Students | 737 | 2.02 | .860 | .032 | | |
| Overall opinion | Teachers | 90 | 2.4844 | .35850 | .03779 | 6.73 | .000 |
| | Students | 737 | 2.6757 | .23859 | .00879 | | |

*df= 825* *Level of significance = .05*

It is obvious from the analysis in the above table that teachers and students behave differently towards the statement *I understand what STSE means in the context of my own learning* as the calculated value for t-test was found to be less (.000) than the tabulated value .05 level of significance (p<.05). second statement *My teacher have tried to teach this way* shows less calculated value for t-test tan tabulated value .05 level of significance. It shows that there is highly significant difference between the perceptions of teachers and students. The third and last statements: *I want to learn this way*, *Time constraints make this approach impossible* also shows greater calculated value for t-test than tabulated value .05 (p..05) Which shows that there is no significance difference between the perceptions of teachers and students. Overall calculated value for t-test was found to be less (.000) than calculated value (p<.05) therefore there is highly significant difference between the perceptions of teachers and students.

**Table 2.** Frequency and percentage for the comparison of the perceptions of teachers and students regarding the aims of sciences

| *Statements* | *Teachers* | | | *Students* | | |
|---|---|---|---|---|---|---|
| | *Frequency* | *%age* | *Ranking* | *Frequency* | *%age* | *Ranking* |
| Acquiring good marks in the examinations | 12 | 13 | 8 | 346 | 47 | 3 |
| To think of becoming scientists in careers | 34 | 38 | 5 | 219 | 30 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| To understand something of how the world works | 44 | 49 | 3 | 400 | 54 | 2 |
| To equip to think scientifically and rationally | 58 | 64 | 1 | 172 | 23 | 6 |
| Knowing scientific facts accurately | 46 | 51 | 2 | 439 | 60 | 1 |
| Understanding of the scientific facts which changes world | 41 | 45 | 4 | 296 | 40 | 4 |
| Showing that scientific results can benefit and hurt human beings | 22 | 24 | 7 | 297 | 40 | 4 |
| Covering the burdened curriculum in allotted time | 14 | 27 | 6 | 41 | 5 | 7 |

Table shows that both the group are responding in a different way as; the highest proportion of teachers 58(64%) chooses the statement '*To equip to think scientifically*', while most rated option for students with 439(60%) proportions highlighted '*To know the facts of science correctly*' as their first priority of science teaching and learning. Second most popular option for teachers was '*To know the facts of science correctly*' with 46(51%) response rate, and '*To understand something of how the world works*' stand out as second priority for 400(54%) students. '*To gain good grades in examinations*' was found to be the 346(47%) student's third priority while the same statement was observed to be the last priority of 12(13%) teacher.

**Table 3:** Comparison in the perceptions of science teachers and students regarding the training skills

| *Statements* | *R* | *N* | *M* | *SD* | *Std. Error Mean* | *t* | *p* |
|---|---|---|---|---|---|---|---|
| My training did not really prepare me well for teaching | Teachers | 90 | 2.81 | 1.14 | .120 | 3.66 | .000 |
| | Students | 737 | 2.25 | 1.39 | .051 | | |
| Never been trained to teach and encourage to implement STSE | Teachers | 90 | 3.34 | 1.14 | .121 | 6.34 | .000 |
| | Students | 737 | 2.39 | 1.36 | .050 | | |
| Need training in teaching effectively by using this approach | Teachers | 90 | 4.07 | .761 | .080 | 3.70 | .000 |
| | Students | 737 | 3.51 | 1.40 | .052 | | |
| Need training to know assessment techniques by using STSE approach | Teachers | 90 | 4.03 | .917 | .097 | 4.64 | .000 |
| | Students | 737 | 3.30 | 1.46 | .054 | | |
| Overall | Teachers | 90 | 3.56 | .697 | .073 | 5.61 | .000 |
| | Students | 737 | 2.86 | 1.15 | .042 | | |

Perceptions of teachers and students are very different as the calculated value for t-test of all the statements was found to be very less (.000) than the tabulated value .05 level of observance ($p<.05$), which shows that there is highly significant difference between the perceptions of teachers and students. Overall calculated value for t-test was also found to be very less than the tabulated value .05 level of observance ($p<.05$), therefore the perceptions of teachers and students are highly different.

**Table 4:** Frequency and percentage for the comparison in the perceptions of science teachers and students regarding the challenges hindering STSE approach

| *Statements* | *Teachers* | | | *Students* | | |
|---|---|---|---|---|---|---|
| | Frequency | %age | Ranking | Frequency | %age | Ranking |
| Overcrowded curriculum | 61 | 68 | 2 | 353 | 48 | 3 |
| Lack of experience | 14 | 15 | 8 | 77 | 10 | 7 |
| Lack of training | 36 | 40 | 5 | 195 | 26 | 5 |
| National examinations | 24 | 27 | 7 | 377 | 51 | 2 |
| Lack of money | 41 | 45 | 4 | 345 | 47 | 4 |
| Lacking student's interest | 43 | 48 | 3 | 379 | 51 | 2 |
| Lacking equipment | 85 | 94 | 1 | 440 | 60 | 1 |
| Unsuitable textbooks | 35 | 39 | 6 | 164 | 22 | 6 |

Both the groups were having similar opinions regarding the first option as highest proportion of teachers 85(94%) and 440(60%) of students had marked '*lack of equipment'*. 61(68%) teachers opted for '*overcrowded curriculum*' and 43(48%) teachers chose '*lack of student's interest*' as their second and third priority. Students are responding in a different way as they chose '*National examination'* 377(51%) and '*overcrowded curriculum* '353(48%) as their second and third most rated options. Teacher's less rated option with 24(27%) proportions is '*National examination*', whereas the same statement was found to be the student's second most rated option with 377(51%) proportion.

**Table 5:** Comparison in the perceptions of teachers and students regarding the social context of sciences

| *Statements* | *R* | *N* | *M* | *SD* | *Std. Error Mean* | *t* | *p* |
|---|---|---|---|---|---|---|---|
| STSE is a good approach | Teachers | 90 | 5.80 | .524 | .055 | 1.286 | .199 |
| | Students | 737 | 5.88 | .543 | .020 | | |
| STSE approach is exciting for me | Teachers | 90 | 5.31 | 1.395 | .147 | 1.733 | .083 |
| | Students | 737 | 5.54 | 1.146 | .042 | | |
| STSE approach is boring for students | Teachers | 90 | 5.02 | 1.565 | .165 | 2.839 | .005 |
| | Students | 737 | 5.43 | 1.264 | .047 | | |
| STSE is helpful for studying of science to pass exams | Teachers | 90 | 4.68 | 1.823 | .192 | 4.09 | .000 |
| | Students | 737 | 5.37 | 1.469 | .054 | | |
| STSE approach is too demanding on time | Teachers | 90 | 3.04 | 2.19 | .232 | 2.246 | .025 |
| | Students | 737 | 3.61 | 2.24 | .083 | | |
| STSE approach is a demanding way | Teachers | 90 | 3.00 | 2.12 | .223 | 7.15 | .000 |
| | Students | 737 | 4.59 | 1.98 | .073 | | |
| STSE approach is consistent with curriculum goals | Teachers | 90 | 4.80 | 1.73 | .182 | 1.10 | .271 |
| | Students | 737 | 5.01 | 1.75 | .064 | | |
| STSE is a new untested approach | Teachers | 90 | 3.09 | 2.21 | .234 | 6.97 | .000 |
| | Students | 737 | 4.70 | 2.04 | .075 | | |
| STSE is inconsistent with textbooks in use | Teachers | 90 | 4.09 | 2.04 | .215 | 7.35 | .000 |
| | Students | 737 | 5.35 | 1.46 | .054 | | |
| Overall | Teachers | 90 | 4.3148 | .892 | .094 | 8.620 | .000 |

| | | | | | |
|---|---|---|---|---|---|
| | Students | 737 | 5.0547 | .752 | .027 |

The above table shows that both groups consider this approach '*Good*' and '*exciting*' as the calculated value for t-test regarding the first and second statement is greater than tabulated value .05 level of significance (p>0.5) therefore there is no significant difference between the perception of teachers and students. For third and fourth statement calculated value for t-test was found to be less then tabulated value .05 level of significance (p<.05) Therefore the perceptions of teachers and students are different. Calculated value for seventh statement was also found to be greater than .05 level of significance (p>.05) which shows that no significant difference between the perceptions of both groups. Remaining statement shows very less calculated value for t-test then tabulated value .05 level of significance (p<.05) therefore the perceptions of teacher and students are different. Overall value for the construct was also found to be very less (.000) then tabulated value .05 level of significance (p<.05) therefore the perceptions of teachers and students are different regarding the teaching of sciences in social context.

**Table 6:** Comparison in the Perceptions of science teachers and students regarding the STSE approach in science education

| *Statements* | *R* | *N* | *M* | *SD* | *Std. Error Mean* | *t* | *p* |
|---|---|---|---|---|---|---|---|
| This approach will not be useful for students | Teachers | 90 | 3.81 | .820 | .086 | 6.92 | .000 |
| | Students | 737 | 4.36 | .693 | .026 | | |
| Relating science with real life of students | Teachers | 90 | 4.38 | .572 | .060 | .822 | .411 |
| | Students | 737 | 4.45 | .750 | .028 | | |
| Appreciating how this approach works better for students | Teachers | 90 | 4.32 | .650 | .069 | 1.18 | .236 |
| | Students | 737 | 4.42 | .735 | .027 | | |
| Communicating verbally to learn science well | Teachers | 90 | 3.89 | .661 | .070 | 1.15 | .250 |
| | Students | 737 | 4.07 | 1.46 | .054 | | |
| In science education issues related to environment and social are discussed | Teachers | 90 | 4.33 | .636 | .067 | 1.47 | .140 |
| | Students | 737 | 4.20 | .858 | .032 | | |
| STSE approach helps to discuss global and local issues | Teachers | 90 | 4.02 | .821 | .087 | .545 | .586 |
| | Students | 737 | 3.96 | 1.00 | .037 | | |
| This approach needs a lot of supports for implementation | Teachers | 90 | 4.20 | .737 | .078 | 2.66 | .008 |
| | Students | 737 | 3.88 | 1.09 | .040 | | |
| Pressurized curriculum do not allow me to teach through this approach | Teachers | 90 | 3.11 | 1.146 | .121 | 2.30 | .021 |
| | Students | 737 | 3.44 | 1.278 | .047 | | |
| Major financial support is required to teach in this way | Teachers | 90 | 4.01 | 1.00 | .105 | .432 | .666 |
| | Students | 737 | 4.07 | 1.13 | .042 | | |
| STSE helps to understand scientific facts effectively | Teachers | 90 | 1.66 | .737 | .078 | 3.96 | .000 |
| | Students | 737 | 2.15 | 1.150 | .042 | | |
| Using this approach will lost the true nature of science | Teachers | 90 | 3.56 | 1.25 | .132 | 1.24 | .214 |
| | Students | 737 | 3.35 | 1.48 | .055 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Overall | Teachers | 90 | 3.7535 | .344 | .03632 | 2.55 | .011 |
| | Students | 737 | 3.8486 | .331 | .01223 | | |

From the above table it is clear that the calculated value regarding first statement '*The STSE approach will not prove attractive for students*' was found to be very less (.000) than the tabulated value .05 level of significance (p<.05) therefore there is significant difference between the perceptions of teachers and students. For second, third, fourth, fifth and sixth statement, the calculated value for t-test was found to be greater than tabulated value .05 level of significance (p>.05) which shows that there is no difference between the perceptions of teachers and students. Statements: '*I need major support to prepare for this approach*', '*The curriculum is so pressurized that I cannot teach this way*' shows that the calculated value for t-test was found to be less than tabulated value .05 level of significance, therefore the perceptions of teachers and students are significantly different. '*The approach will require major financial support*' and '*the true nature of science will be lost if we use this approach*', shows high calculated value for t-test than tabulated value .05 level of significance (p>.05), therefore there is no difference between the perception of teachers and students. Overall value of the construct for t-test was found to be less than tabulated value which shows the significant difference between the perceptions of teachers and students.

**Table 7:** Frequency and percentage for the comparison between the suggestions and recommendations by teachers and students

| *Statements* | *Teachers* | | | *Students* | | |
|---|---|---|---|---|---|---|
| | Frequency | %age | Ranking | Frequency | %age | Ranking |
| Curriculum should be consisted of STSE approach | 50 | 55 | 1 | 302 | 41 | 1 |
| Facilities must be provided for successive implementation of STSE | 10 | 11 | 4 | 260 | 34 | 2 |
| Appropriate training for implementation of STSE is required | 13 | 15 | 3 | 107 | 14 | 3 |
| Financial resources are required | 17 | 19 | 2 | 82 | 11 | 4 |

Views of science teachers and students were found to be same in responding about the first statement as more than half (N=50, 55%) of science teachers and highest proportions of students (N=302, 41%) answered that STSE approach should be the part of science curriculum. Maximum number (N=17, 19%) of science teachers stated financial resources as their second rated option, whereas major proportion of students (N=260, 34%) suggested the allocation of physical facilities to schools. Both of the group was found having similar views regarding their third answer where 17(19%) teachers and 82(11%) students suggested proper training about STSE.

## Discussion

Significant differences were found between the perceptions of science teachers and students regarding understanding the meaning of science in local context, teacher trying to teach by using STSE approach, and not convincing that STSE is the best approach for Pakistan while no significant differences were found between the perceptions of science teachers and students regarding want to learn in this way and time constraints make this approach impossible in this context.

Both science teachers and students agreed that aims of teaching sciences are to equip students to think scientifically, learning of scientific facts, understanding of how the world works, to get good marks in examinations, becoming scientists in career, cover curriculum in allocated time and scientific findings may be utilized to provide benefits or harm the human society. Significant differences were found between science teachers and students regarding common training is not enough to prepare science teachers to teach effectively in classroom, science teachers needs special sort of training to implement this approach during instruction and science teachers also need training to use appropriate assessment techniques. Both science teachers and students agreed that lack of equipment, lack of student interest, overloaded curriculum, lacking financial resources, lacking of appropriate training, and inappropriate textbooks are the major challenges hindering STSE approach.

Significant differences were found between the views of science teachers and students regarding STSE is a good approach, exciting approach, and is consistent with curriculum goals. While no significant differences were found between science teachers and students regarding boring for students, helpful for studying of science to pass examinations, too demanding on time, a new untested approach and inconsistent with textbooks in use. Significant differences were found between science teachers and students regarding STSE is not proved to be attractive, require a lot of supports for implementation of this approach, overloaded curriculum do not allow to teach through STSE and science education must focus on the scientific facts. While no significant differences were found between the perceptions of science teachers and students regarding understanding of students to relate it with practical life issues, appreciate the approach by students, learning to communicate verbally by students, importance of social and environmental issues, discussion of local and global issues, requirement of financial resources and losing of true nature of science. Both teachers and students agreed that STSE must be incorporated in science curriculum and implemented in classroom, financial resources be provided to schools and science teachers must be provided training about STSE.

Students bear the great responsibility of making choices that call for knowledge of how science and technology interact with one another and with society and the environment. Although the STSE movement has been closely associated with achieving this aim, it has proven challenging to put theory into reality. It has been proposed that scientific education should focus more on the STSE in response to the urgent requirements of contemporary societies. According to Zeidler et al., (2009), science is rooted in socially-related issues and can drive participation in conversations that 'unearth' personal links and linkages to controversial scientific questions". According to the constructivist viewpoint, which Watts (1994) referred to, science needs to be applicable to students' daily lives because this actual context serves as the foundation for their studies. It must be relevant to their interests and current lifestyles, to current events and television news, and to global citizens and customs (Mansour; 2007).

## Conclusions

It is concluded that both science teachers and students agreed that STSE is an effective approach for teaching of science subjects.

However, due to some constraints like time and resources the implementation of this approach is not possible. Both science teachers and students perceived that the major aim of STSE approach is to think scientifically and knowing the scientific facts. Both science teachers and students agreed that implementation of STSE approach in classroom require special kind of training. However, the training obtained by science teachers do not help them to prepare them to implement STSE approach in classroom. It was concluded that both science teachers and students agreed on the importance of STSE approach. However, there are some challenges due to which this activity-based and experimentation approach cannot be implemented. These challenges include the overloaded curriculum, lack of available physical and financial resources.

Significant differences were found between the perceptions of science teachers and students regarding STSE is a boring approach, helpful for passing of examination, too demanding on time, a new untested approach and is inconsistent with textbooks in use. While non-significant differences were found between the perceptions of science teachers and students regarding STSE is a good approach, an exciting approach and is consistent with curriculum goals.

No significant differences were found between science teachers and students regarding using STSE approach will ensure to make relationship of science with life, appreciation of science by students how it works better to solve life related problems, communicate science verbally, importance of understanding social and environmental issues, discussing local and global issues, require major financial resources and losing of true nature of science. On the other hand significant differences were found between science teachers and students perceptions regarding STSE is not attractive for students, require main support from stakeholders, pressurized curriculum doesn't allow to implement in classroom and science education focus on scientific facts. Both science teachers and students agreed that STSE based curriculum may be developed, a lot of resources and facilities are required for the implementation of STSE approach, training for using this approach must be provided to science teachers and financial resources be provided to implement this approach in classroom teaching.

## Recommendations

The researchers offered following recommendations to Government, policy makers, curriculum developers, and science teachers for the implementation of STSE approach.

1. It was recommended that government and policy makers must ensure the science curriculum development based on STSE approach. This may be possible if curriculum developers are assigned the task to develop curriculum based on this approach. The involvement of science teachers in this process may validate and authenticate the process.
2. To ensure the implementation of this approach in the teaching of science subjects in classrooms, science teachers may be provided in-service training to enrich their understanding and implementation regarding this approach. The development of low cost materials for teaching and the solution of day to day problems through this method will be a worthwhile strategy for its implementation.

It is recommended that science subject's curriculum must be integrated with society and environment issues. So that students may be able to resolve societal and environmental issues. Science teachers must ensure the use of instructional technology for teaching learning process. Use of innovative assessment techniques during examinations and tests can ensure the evaluation of students' scientific and critical thinking abilities.

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