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# Status of the Level of Transversal Competencies of Secondary Science Students

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## Abstract

This research was designed to assess the current status of the level of Transversal Competencies (TVCs) of secondary science students. This study focused on a single variable of Transversal competencies discussed under six domains, first one was critical and innovative thinking, second one was interpersonal skills, third one was intrapersonal skills, fourth one was global citizenship, next one was information literacy (IL) and media, and the last and the sixth domain, was related to religious values and physical health (United Nations Educational, Scientific, and Cultural Organization Bangkok, 2015, 2016). Transversal competencies were defined under the above-mentioned domains, in the framework presented by UNESCO in collaboration with ERI-Net (Education Research Institute Network). It was a descriptive self-reported survey study. All secondary science students studying in schools in the Islamabad territory were the population of this research. The technique used to select the sample of this study was multistage random sampling. One questionnaire was developed for this study, having 74 statements to assess these competencies. A panel of experts ensured the validity of scales, Content Validity Index was calculated, which showed the tool was excellent. For reliability, Cronbach's alpha was calculated to measure internal consistency. Internal consistency of each domain was calculated separately, and the results were satisfactory. The researcher visited the schools to collect the data. Data was analyzed by using descriptive statistics. Mean and standard deviation (SD) statistical analysis were used for the results. The results elaborated that secondary science students are at an intermediate level in their Transversal competencies.

***Keywords*:** Transversal Competencies, 21st Century Skills, Critical, Innovative Thinking, Information Literacy, Interpersonal Skills, Global Citizenship and Religious Values and Physical Health.

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## Introduction

These competencies are the set of competencies needed to meet the challenges of the future. These Competencies are not specific to any single field of life. These are skills, attitudes and values essential for survival in this globalized world (UNESCO Bangkok, 2015). The rapidly changing world, driven by advancements in Technology, demands proper modifications in every aspect of life. The same is the case for the education sector. This rapidly evolving world needs a more flexible, skill-based, future-focused, and child-centred educational system. It is widely acknowledged that to tackle the challenges and problems of the modern world, educational systems, curricula, and pedagogies must undergo reform. Every state needs an educational system that prepares its pupils for global perspectives in the context of advancement and globalization. Large number of organizations are working on projects to create a framework for education for the students to compete in the 21st-century global market. Education For All (EFA), an agenda for education in 2030, is renowned in this regard, which was put forth by the UNESCO and OECD. In this context, the Millennium Development Goals, commonly called MDGs from 2000 to 2015, and the Sustainable Development Goals called SDGs, from 2015 to 2030. Critical thinking, creativity, problem solving, adaptability, collaboration, communication, self-awareness, self-management, respect for diversity, tolerance, and ethical use of digital tools are all skills that are considered fundamental for the achievement of these SDGs, especially for SDG 4, which is related to quality education. It is much more important to improve the quality of education. As it can foster the achievement of other SDGs like SDG 8, which is related to decent work and economic growth, and SDG 17, related to Partnerships for the goals. Higher Education Commission's (HEC) Vision 2025 is also important in this regard.

Rapidly changing labour markets, advancements in technology, population growth, immigration, instability in politics, destruction of the environment, climate change, disasters and risks, competition for natural assets, challenges with demographics, increasing global unemployment, pervasive poverty, increasing inequalities, and increased dangers to stability and safety all require the upgrading and versatility of educational systems (The Framework for Action on Education,2030).

Transversal competencies are the blend of life and work and are helpful for better academic and professional performance, as they help to adapt and survive in a rapidly changing environment, along with the

social and personal development of a person. Keeping all the importance of these competencies in mind, a plan is needed to incorporate these competencies into our education system. At the systematic level, national and regional governments are involved in mandatory changes in the national curriculum and policy. Development of standards for the assessment framework and funding that is required for teachers' training in this regard. At the institutional level, schools, colleges, and universities are involved in the integration of TVCs-based curriculum and modules and teacher support in the educational institutions. At the instructional level, the teacher and students are involved; teacher can use classroom pedagogies to incorporate TVCs, use active learning strategies, and development of competency-based assessments, and prepare students for a rapidly changing future.

## Statement of the Problem

In order to meet SDGs for quality education, reforms are required on a large scale in the educational environment of Pakistan to develop or enhance TVC skills in the students to compete internationally. Incorporation of these skills in the educational policies, curriculum, and practices demands a study on the current level of these skills in students. The assessment of the current level of these competencies is a prerequisite to move further towards educational change and Education 2030. Pakistan lacks this type of research and analysis.

## Significance of the study

This study will be helpful to understand the current level of transversal competencies in the students. It will help to know where we are. It will be useful to know how these competencies vary with age in the students. This research will also provide information about the competencies of students of different types of schools. On the basis of this research, a framework can be proposed to develop or enhance these skills in the students. This study can be considered the first towards a transversal competencies' framework.

## Literature Review

## Transversal competencies

The importance of competencies can be understood in education by knowing the difference between qualification, knowledge, skill, and

competency. Qualification is simply an outcome of an assessment through formal education. A person is considered qualified when a competent body declares that he or she has command of the set objectives of a course. A degree or diploma is proof of this declaration (Więcek-Janka et al., 2017).

Knowledge is the product of the adaptation of information through learning. Knowledge is developed and grounded on facts, theories, and principles (Winterton et al., 2006). Skill is the ability of a person to apply knowledge to daily matters. It combines all knowledge, ability and practice (Noe, Hollenbeck, Gerhart, & Wright, 2021).

Competencies are defined in different ways; simply, competencies are the set of skills required to perform a task. Competencies are divided into two categories, which are professional competencies and personal competencies. Professional competencies may include technical skills, knowledge about work, experience related to work, etc. Personal competencies are related to the behavior of a person. Personal competencies may be called behavioral competencies. These competencies may include leadership, motivation, tolerance, compassion, empathy, etc.

The set of competencies needed to meet the challenges of the future is known as transversal competencies(Central University of Applied Sciences, 2017).Attitudes are the set of beliefs, values, and thoughts that make the mind set of person, on the bases of which he or she respond or react in a situation(European Commission, 2018).

Different nations use different words, such as soft skills, life skills, 21st century skills, non-disciplinary skills, non-cognitive abilities, etc., to define the competences or talents that are crucial for learners outside of academic subjects. These abilities were dubbed "Transversal Competencies" by ERI-Net in 2012 and described as the skills, abilities, attitudes, and values necessary for the learners' holistic development and making them capable of change. ERI-Net published a framework to explain these competencies. This framework is based on six broad domains. These domains are described in the table below.

**Table 1**
*ERI-Net Framework on Transversal Competencies.*

| Domains | Examples of key skills, competencies, values, and attitudes |
|---|---|
| Critical and innovative thinking | Creativity, reasoned decision making, reflective thinking, entrepreneurship, applications skills, resourcefulness. |
| Interpersonal skills | Organizational skills, collegiality, teamwork, communication skills, collaboration, compassion, sociability, empathy. |
| Intrapersonal skills | Self discipline, self motivation, flexibility and adaptability, self respect, self-awareness, perseverance, ,compassion, integrity, ability to learn independently, |
| Global citizenship | awareness, openness, respect for diversity, intellectual understanding, ability to resolve conflicts, responsibility, democratic participation, respect for environment, national identity, sense of belonging, tolerance, ethical understanding, conflict resolution, |
| Media and information literacy | ability to critically evaluate information and media content, ability to obtain and analyze information through ICT, ethical use of ICT |
| Other (Religious values, physical health) | Appreciation of a healthy lifestyle, respect for religious values |

Source: (Asia Pacific Education Research Institutes Network, 2018)

TVCs are not just a set of skills, but it is a comprehensive model to incorporate these skills in an education system. It is based on four levels, which are interconnected. Firstly, these skills integrate with policy; secondly, in the curriculum; thirdly, how to teach these skills in the classroom, and lastly, how these skills could be assessed.

## Theoretical Framework

The TVCs framework that is used in this study is not based on a single theory. Multiple skills, attitudes, values, and competencies are listed in the ERI-Net framework of TVCs. It can be said that this framework addresses sociocultural theory and constructivism given by Vygotsky, Dewey, and Piaget. Collaboration, communication, adaptability, experiential learning, respect for diversity, critical and creative thinking. Digital literacy, conflict resolution, all fall under these theories directly or indirectly. It is believed that competencies are constructed with active participation, experiences, problem-solving, and with social interaction. Social and cognitive constructivism both are reflected in the construction of these competencies in the students.

Overall, this framework is based on holistic learning that is aligned with sustainable development goal related to quality education. It is presented to do regional research in order to address the real challenges in the path of quality education. SDG target 4.7 is addressed in order to consider cognitive, behavioral, and socio-emotional domains (Nyamkhuu & Morohashi, 2019).

### Objective

- To measure the current status of the level of TVCSs of secondary science students.

## Research Questions

1. What is the current status of the level of TVCs of the secondary science students?
2. What is the current status of the level of Critical and innovative thinking of secondary science students?
3. What is the current status of the level of interpersonal skills of secondary science students?
4. What is the current status of the level of intrapersonal skills of secondary science students?
5. What is the current status of the level of global citizenship of secondary science students?
6. What is the current status of the level of media and information literacy of secondary science students?
7. What is the current status of the level of religious values and physical health-related skills of secondary science students?

### Delimitation of the study

Keeping in mind the research objectives, the convenience of the researcher and resources (time and money), the study is limited to secondary science students studying in the secondary schools of the Islamabad territory.

## Research Methodology

Here is the detail of methodology.

## Research Design

It is a descriptive study. A self-report questionnaire is used for this research.

## Population of study

All the secondary science students studying in the secondary schools of the federal territory were the population of this research.

## Sampling Technique

A multistage random sampling was used to select the sample.

## Instrumentation

After a deep study of the related literature of Transversal Competencies, constructs for each domain mentioned in the framework are defined. Constructs are defined such that each construct covers all the aspects of that domain. Each domain is already divided into sub-domains or sub-constructs in the framework. In order to make the domains and their sub constructs clearer, each sub construct is further explained in the form of indicators, and a pool of items is developed by keeping in mind the construct definition, sub constructs, and indicators. The format of this questionnaire is a 4-point Likert response. Firstly, Important information is taken from the participants in the form of gender, region from which he/she belongs, age, grade, mother tongue, and school name. After that, there are six sections, each of which covers a domain of the framework.

## Instrument Validation

A thorough assessment of relevant literature was conducted, and item pools were created for each of the six scales in order to create a valid and trustworthy instrument. To get their opinions on the questionnaire and to respond to each statement, a panel of specialists was consulted. A three-point scale (Essential=2, Necessary=1, and Irrelevant=0) was used in the Content Validity Index (CVI) technique. CVI results are as under, with 25 statements, 100% agreement. On the basis of the results, the questionnaire was considered a valid tool of the study.

## Reliability of instrument

After entering the data in SPSS software, an analysis was done for internal consistency. Cronbach's alpha was applied to each domain one by one to find inter-item correlation. For Critical and Innovative domain, the value of Cronbach's alpha was 0.639, for Interpersonal skills it was 0.740, for Intrapersonal skills it was 0.714, 0.778 for Global citizenship, and lastly for Media and information Literacy it was 0.6711. Having all values more than 0.8. It can be said that the tool has internal consistency and is reliable for further study.

## Data Analysis Technique(s)

Data analysis was done by using descriptive statistics. Mean values and standard deviations of data were calculated from the collected data in order to address the research questions**.**

## Results

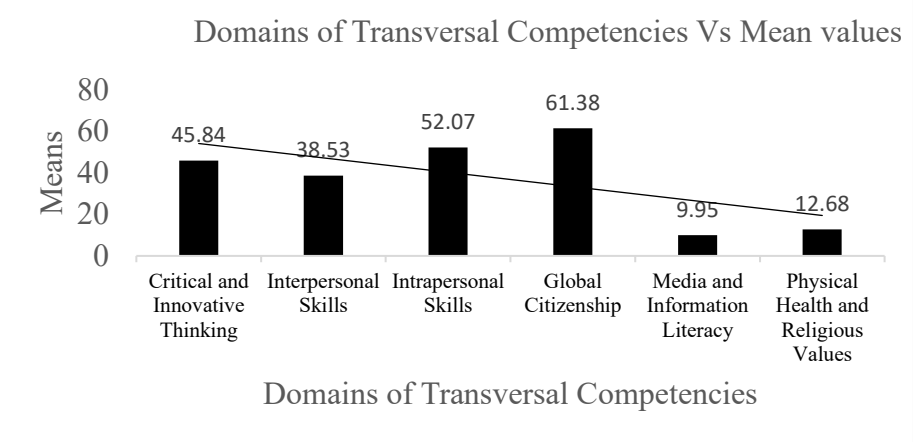
**Table 1**

*Transversal Competencies*

| Domains of TVCs | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|
| Critical and Innovative Thinking | 15.00 | 60.00 | 45.8390 | 6.02840 |
| Interpersonal Skills | 12.00 | 48.00 | 38.5306 | 4.70126 |
| Intrapersonal Skills | 19.00 | 76.00 | 52.0725 | 6.83250 |
| Global Citizenship | 20.00 | 80.00 | 61.3780 | 6.97870 |
| Media and Information Literacy | 4.00 | 16.00 | 9.9482 | 2.57840 |
| Physical health and religious values | 4.00 | 16.00 | 12.6768 | 2.02131 |

**Figure 1**

*Domains of Transversal Competencies Vs Mean Values*




By analyzing the data collected through a survey from the students of different age groups studying in different types of schools following findings were drawn.

- The current level of critical and innovative thinking skills of students is at good level. Most of the students have this set of skills.
- The current level of interpersonal skills of students is at very good level. Most of the students are comparatively better in this set of skills as compared to the skills set of critical and innovative thinking.
- The current level of intrapersonal skills of students is at a good level. Most of the students have this skill set.

- The current level of global citizenship of students is at a good level. Most of the students have this skill set.
- The current level of media and information literacy of students is at a satisfactory level. Students in this skill set are comparatively at a low level compared to the other skill sets discussed in this study.
- The current level of physical health and religious values of students is at a good level. Most of the students have this set of skills.
- Comparative analysis of different domains of transversal competencies showed that students are good in intrapersonal skills and global citizenship. Students are comparatively less competent in was information literacy (IL) and media, and the religious values and physical health domains.

  The results from the data showed that
- The current level of Transversal competencies of the students is satisfactory, but they are not at an excellent level in these competencies; there is room for improvement.

The current level of Transversal competencies of the students is satisfactory, but they are not at an excellent level; there is room for improvement.

## Discussion

This study can be helpful to design any policy regarding SDGs to give quality education to the students and preparing them to compete globally. This study may be the first step towards the attainment of TVCs for the students, an assessment of current level can define what efforts are needed further. The results retrived by data analysis showed that students are currently at an intermediate level of TVCs. There are areas of improvement towards the competencies. It can be done by adding or improving some curricular and co-curricular activities. Osipovskaya et al. (2024) argued that it is essential to understand the level of competencies of students, as this guides the development of an informed curriculum design that facilitates the integration of transversal competencies in teaching. It shows the students' readiness toward these competencies. It ultimately assists in building an educated workforce. Guerra-Macías and Tobón (2024) found a relationship between transversal skill development and pedagogical practices and learning strategies. It is suggested that by measuring the level of these

competencies, it is quite helpful to evaluate any pedagogy, like inquiry-based learning or problem-based learning.

**Recommendations**

- It is needed to assess the improvement in the competencies of the students as they are promoted to the next grade.
- It is important to know whether the teachers and administrators are aware about the importance of these competencies.
- Trainings and workshops should be conducted for the awareness of these transversal competencies for teachers, administrators, curriculum designers etc.

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