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**Advanced Competencies of Teachers to Improve  
Vocational Education in Applied Technology Schools**

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### List of Abbreviations:

ATS	Applied Technology Schools
Cedefop	European Centre for the Development of Vocational Training
CEDEFOP	European Centre for the Development of Vocational Training
ECVET	European credit system for vocational education and training
EDF	Education Development Fund
EQF	European Qualifications Framework
EU	European Union
GOE	Government of Egypt
ICT	Information and communications technology

ILO	International Labor Organization
ITET	Initial Teacher Education and Training
ISCED	International standard classification of education
KELA	Kansaneläkelaitos, Social Insurance Institution of Finland
LLL	Lifelong learning
LO	Learning outcome
MENA	Middle East and North Africa
MoE	Ministry of Education
MoETE	Ministry of Education and Technical Education
MoH	Ministry of Housing
MoHE	Ministry of Higher Education
MoHP	Ministry of Health and Population
MoM	Ministry of Manpower
MoTI	Ministry of Trade and Industry
PAT	Professional Academy for Teachers
TELMA	Preparatory education and training for work and independent living
TVET	Technical and vocational education and training
TVETA	Technical Vocational Education for Teachers' Academy
UK	United Kingdom
UN	United Nations
UNEVOC	International Centre for Technical and Vocational Education and Training
USA	United States of America
VALMA	Preparatory education and training for VET
VET	Vocational education and training
VET	Vocational education and training
ETF	Exchange-traded fund
NESP	National Environmental Science Program
ATS	Applied Technology Schools
WBL	Work-Based Learning
GOE	Government of Egypt
HR	Human Resources

## **Chapter One: Rationale of the ATS Training Needs Assessment**

### **Introduction:**

The Advanced Technology schools (ATS) that have recently been introduced to the Egyptian education system in 2018 is seen to be the driving locomotive for economic and social development in Egypt. Hence, the government is providing for every possible means for enhancing the quality of education at ATS, through the provision of quality infrastructure, reliable and sustainable connections with industry, quality human resources, relevant curricula and many other factors that can boost the operation and outcomes of these schools. The following study is focusing on the human resources dimension and is seeking to assess the pedagogical training needs of the teachers and trainers at those schools for the purpose of developing relevant and effective capacity building program for them.

### **Study Problem**

Given the very recent introduction of such a unique nature of schools on the land of Egypt, relying on international models of education, it is not yet institutionalised for the teaching and training competencies of the teachers and trainers at those schools. Due to this novice nature of schools, no evaluation studies have been conducted so far to verify the excellence features in them. Thus, the current study is trying to investigate the training needs assessment of the ATS teachers and trainers.

### **Study Objectives**

The current study is aiming at assessing teachers' competencies at the Advanced Technology Schools (ATS).

### **Theoretical Framework and Literature Review**

Vocational education and training (VET) plays a central role in preparing young people for work, developing the skills of adults and responding to the labour-market needs of the economy. Teachers and leaders in VET can have an immediate and positive influence on learners' skills, employability and career development (OECD, 2021). In the VET system, in general, the job of teachers and trainers has grown more complex in recent years. Guidance, counselling, teamwork, collaboration with businesses, and stakeholder communication have all become more crucial. All nations can see this evolution, but it is particularly noticeable in those undergoing extensive reforms to adapt to the new VET system realities, particularly in the context of the emerging knowledge society. However, it is not always simple to carry out in reality the obligations outlined in laws and regulations. The real participation of teachers in the various settings may be hampered by a lack of funds and an inability to keep up with technological advancements. The need of connecting vocational and teaching skills is being underlined throughout the EU. (CEDEFOP, 2005)

The core competencies of VET teachers include teaching their subject, guaranteeing learning progression, engaging in examinations and evaluations, and assisting their learners. It is crucial to develop a teacher identity alongside this vocational identity because the identity of the vocational subject teachers frequently lies in their job, trade, or craft. There are significant regional differences in the autonomy and function of VET teachers. VET teachers have a notable impact at the institutional level in some of the more decentralised systems, such as the Danish, Norwegian, Dutch, and Finnish systems, as well as in some of the more recent Member States (Latvia, Hungary, and Poland). The Greek, Spanish, French, and Luxembourgish systems, among others with a greater degree of centralization. (CEDEFOP, 2005)

### **Approaches to Improving Teacher Training in Egypt**

Megahed has highlighted the following approaches that are being adopted for improving teachers' training process within the Egyptian context: (Megahed, 2014)

- Establishment of the Technical & Vocational Education Teachers Academy (TVETA).
- Train technical teachers and trainers.
- Capacity building and accreditation of Master trainers on technical skills.
- Competency-based training and awareness.
- Qualification system for teachers.
- Language training and education for teachers and managers.

- Training of assessors and internal verifiers.
- Develop a TVET research unit within TVETA.
- Set initial education standards for technical teachers and instructors training and qualification standards for in-company tutors and instructors.

Many countries face a shortage of teachers and trainers in vocational education and training (VET) institutions. Some teachers and trainers are also poorly equipped to teach because they lack recent workplace experience. By contrast, trainers of apprentices and trainees in companies often have no specific pedagogical preparation so Vocational trainers in VET institutions are often required to complete a pedagogical course. Allowing skilled workers to acquire their pedagogical competencies in a flexible way (e.g. distance learning, recognition of prior learning). The effects of a pedagogical training on teachers and the Schools will be great. Due to the fact that the Vocational teachers and trainers are essential to supporting skills development in the workforce the competences of vocational teachers and the quality of teachers' work is probably more influenced by the institutional environment in which they work than their formal teacher education. Strategic school development is therefore a promising strategy where the development of schools and curricula, as well as the organisation of learning and teachers may go hand in hand. (OECD, 2021)

The training leads to that the new professional profile of teachers includes innovation and development as a key competence. Teachers become no longer the executors of education programmes decided in detail by others. They have to adapt learning processes and outcomes to the specific – changing needs of their students and local labour market situations. Teachers are now stakeholders in their capacity of education professionals. The current reforms in education and training are not one-off events designed by external experts but ongoing change processes set within a broadly agreed reform agenda. (Universty, 2015-2017)

Beside that Higher level qualifications in VET pedagogy improve teaching approaches, confidence and ability to address diversity in contexts, learners and AQF level of teaching. Participation in both formal and informal professional development, in industry/discipline areas and in VET teaching, increases with higher qualifications, irrespective of the type of qualification. Teachers with higher level qualifications contribute more to their employing organisations in curriculum and assessment development, leadership and project work. The quality of teacher training has a direct correlation with student learning outcomes. The more effective the training, the more significant the impact on student achievement. (Rashid, 2023) The great impact will be on the Improving Pedagogical Skills because Teacher training helps teachers develop a better understanding of effective teaching strategies and techniques. By learning how to use these strategies, teachers can engage students and facilitate their learning, leading to improved academic performance. It can also help in Enhancing Content Knowledge by gaining a deeper understanding of the subject matter, teachers can deliver more effective lessons, provide students with better explanations, and answer their questions with more clarity and confidence. Teacher training can also help teachers develop effective classroom management skills. Effective classroom management techniques help create a positive learning environment, reduce disruptive behavior, and improve student engagement and academic performance. In Addition, it can also facilitate collaboration among teachers. Collaborative activities, such as team teaching, lesson planning, and peer mentoring, can provide teachers with opportunities to share knowledge and best practices, leading to improved teaching practices and student learning outcomes.

Teacher training can also impact student motivation. Teachers who receive high-quality training are better equipped to create engaging and challenging learning experiences that motivate students to learn and achieve their goals. (Rashid, 2023) They should understand active learning methods and pedagogy; support training; apply various active teaching methods, techniques and processes; have practical classroom experience; and be involved or at least informed of research in their area of expertise. Classroom management and pedagogical skills help develop more effective teachers. Classroom management, providing feedback, learner-centred practices, and flipped classrooms appear to have a positive impact on learner performance. Pre- and in-service teacher education programmes could develop these skills. CPD programmes focusing on subject-specific pedagogy could enhance learning significantly. Include the development of social-emotional competencies during pre- and in-service teacher training. These influence teaching effectiveness,



mental and emotional well-being, and willingness to continue teaching, and improve students' academic learning and mental. Understanding how behaviour and emotion affect teaching and learning helps teachers confidently create a positive learning environment. CPD that deepens knowledge of social-emotional theories, concepts, and activities for teachers to improve their own social-emotional competencies can provide a model for students and create a positive learning environment. (Unesco, 2023)

### **International Models for Teachers and Trainers' Training**

Teaching in VET must include initial teacher education and training (ITET), which enables aspiring educators to acquire the knowledge and credentials they need. To guarantee that VET teachers have a solid balance of pedagogical abilities, vocational competence, and industry knowledge, it is crucial to design appropriate ITET programmes for them. The level of education that VET teachers have attained, along with their professional experience and possibilities for continuing education, all significantly influence how competent they are as teachers. For VET teachers who are transitioning from the business world to the classroom, training in pedagogical skills is particularly important. (OECD, 2021)

Different OECD countries have different structures for ITET. At the postsecondary education level, it typically takes the shape of a degree course in teacher preparation. This occasionally includes training in practise. Some nations hold national or subnational exams, usually at the conclusion of the course. In these nations, national or sub-national qualification criteria have a significant influence on the design and content of ITET. ITET is frequently offered by higher education institutions or government agencies with a focus on ITET, but it may also include many components that are offered by various institutions. While different groups may offer training in pedagogical or occupational subjects, other organisations may award certification of knowledge and skills. For future VET teachers to benefit from ITET, several nations offer targeted financial assistance. Given that people who come from the business world frequently already possess some of the abilities sought by ITET and may need the freedom to combine a teaching position with ITET, ITET may be designed differently for them through more flexible pathways. (OECD, 2021)

There is ample proof of ITET's usefulness. According to TALIS statistics, VET teachers who benefited from training in particular teaching duties or tasks during their ITET were more prepared to assume these duties in their classrooms. The whole set of abilities needed by VET teachers does not appear to be covered by certain countries' current ITET policies. For instance, ITET for VET teachers seems to be less effective than ITET for general education teachers at building pedagogical abilities. Even though they had taken ITET in those areas, a sizable portion of VET teachers in a few OECD countries still felt unprepared in general pedagogy (16%) and subject-specific pedagogy (17%). In comparison to ITET for general education, ITET for VET teachers appears to be less effective at building pedagogical abilities. It should be highlighted that these data only cover a small number of nations, and that additional information and research are required to fully understand the relationship between the structure and content of ITET and the level of readiness experienced by VET teachers. (OECD, 2021)

It is not always the case that in-house trainers receive specialised training. However, several nations, such as Austria, Germany, and Switzerland, set some minimal standards for trainers and have a specific training programme available. For instance, Germany provides extensive optional training for trainers: courses for trainers to prepare for the trainer aptitude exam are frequently offered by the Chambers of Industry, Commerce, and Crafts, and they are integrated into Master craftsperson courses; in addition, many programmes at universities of applied sciences also offer the trainer training courses. Optional training packages are frequently offered, even in nations where having a formal training degree is not needed of trainers. Training providers and material differ between nations. For the quality of ITET, coordination between VET institutions and teacher-training institutes is crucial in many ways. The learning requirements of the teacher applicants and the training requirements of the VET school that would ultimately hire those candidates must be taken into consideration when planning and delivering ITET. When teacher-training providers work closely with VET institutions to produce research and innovation in pedagogical techniques, they can better maintain the ITET curriculum for VET instructors (OECD, 2021)

In India, the Craft Instructor Training Scheme (CITS) and the Hi-Tech Training Scheme (HTS) are two Indian programmes that deal with the training of instructors. The CITS trains teachers or trainers at various DGT training facilities (Directorate General of Training). In India, there are 12 Regional Vocational Training Institutes (RVTI), 1 National Vocational Training Institute (NVTI), 5 Regional Advanced Training Institutes (ATIs), and 1 Craftsmen Training Institute (CTI) at the national level. It includes 29 of the 121 teacher training disciplines. A total of 1,600 instructors can be trained annually by engineering trade institutes, including the NVTI and RVTI for women's training, which together train about 500 female participants annually. (Pilz & Gengaiah, 2018)

The Ministry of Skill Development and Entrepreneurship's DGT is in charge of educating VET instructors in India. The Craft Instructor Training Scheme (CITS) and the Hi-Tech Training Scheme (HTS) are two programmes for the training of instructors. At several DGT training facilities, teachers or trainers are trained by the CITS. In India, there are 12 Regional Vocational Training Institutes (RVTI), 1 National Vocational Training Institute (NVTI), 5 Regional Advanced Training Institutes (ATIs), and 1 Craftsmen Training Institute (CTI) at the national level. It includes 29 of the 121 teacher training disciplines. A total of 1,600 instructors can be trained annually by engineering trade institutes, including the NVTI and RVTI for women's training, which together train about 500 female participants annually. (Pilz & Gengaiah, 2018)

To be accepted into the Craft Instructor Training programme, applicants must have either a technical or academic qualification. Additionally, all applicants must pass the All India Common Entrance Test, which consists of open-ended questions testing "logical, numerical, and reasoning" aptitude and multiple-choice questions covering a particular trade (75%). To provide for greater flexibility in the selection of training institutions, the one-year craft teacher training programme was transformed into a modular training programme in 2009. The completion of a single module could take three months. The teacher training programme was updated and given a one-year duration in August 2014. Four modules make up a course. According to the Central Training Institute for Instructors (2016), every student undergoing instructor training must successfully complete a module on Training Methodology (TM), which covers subjects like "principles of teaching, learning psychology, workshop administration, motivation, use of computers and audio-visual aids in teaching, preparation of lesson plan," etc. Additionally, depending on their profession, trainees in engineering trades must successfully complete two modules on profession Technology and an Engineering Technology (ET) module. A module on Vocational Calculation and Science as well as two Trade Skill modules must be completed by trainees in non-engineering trades. (Pilz & Gengaiah, 2018)

To be eligible to take the final exam, trainees must finish the two-semester training programme "within 3 years of their admission". They pass the All India Final Trade Test after finishing their training, and they are then awarded a National Craft Instructor (ITI Instructor) Certificate. With the assistance of the ILO, the NCVT, the DGT, the MoLE, and the Government of India established the Central Training Institute for Instructors in 1962. The institute's purpose is to train the instructors for ITIs and ITCs. Chennai is home to the sole national facility with excellent transport options, including flights, trains, and roads. The one-year programme is broken out into four modules covering Trade Technology I (TT-I) and II (TT-II), ET, and TM, each lasting three months. Trainers must successfully finish the TT-I module in order to go on to the TT-II module. Depending on the student and the type of enrollment, the cost of the course varies. For officials who have already been posted, a module costs 1.50 euros. Regular participants must pay 8 euros, however members of the Scheduled Castes (SCs) or Scheduled Tribes (STs) community pay only 2.50 euros. The teaching staff is provided with accommodations because the CTI is close by. According to the Central Training Institute for Instructor (2014), lodging costs 4 euros per module. (Pilz & Gengaiah, 2018)

The ATS program employs a total of 15,000 teachers which shows a positive growth with respect to number of participants. For this reason, the DGT calculates with an increase of 2,000 teachers per year. In addition, approximately 3,000 teachers are required each year to counter natural processes such as retirement. With the ATS and CTS training programs, an additional 10,000 teachers may get recruited every year. The United Nations Development Programme (UNDP) and the ILO helped the DGT launch the ATIs. Howrah, Hyderabad, Mumbai, Kanpur, and Ludhiana are all home to five ATIs. Incoming instructors at ITIs/ITCs or other training

facilities are the target audience for the programmes (like the central CTI teaching facility). The "Principle of Teaching (PoT)" is taught in the one-year-long courses. For instructors who want to upgrade their knowledge and abilities or use the most recent technologies in the classroom, there are also refresher courses available. This program's flagship can train up to 1,200 people annually. Under the HTS, high-technology training is provided for 2- or 3-week courses in the ATIs/Advanced Training Institute for Electronics and Process Instrumentation (ATI-EPI) for the industries/public sector undertakings/government organizations/trainers from the institutes/industries, etc. (Pilz & Gengaiyah, 2018)

The World Bank-funded Vocational Training Project has the HTS in mind as a component of its plan. Currently, the Indian government is paying for it. The HTS is designed to provide training in the use of electronics, computers, and contemporary production systems. These skills are needed by business, industry, and home consumers. Ten ITIs and central institutes (ATIs/ATI-EPI and Apex Hitech Institute in Bangalore) are responsible for teaching courses in CAD/CAM, CNC, Control Technology, and other subjects. To increase the work opportunities for women from all age groups and social backgrounds, the federal and state governments developed a variety of vocational training centres for women. Only women are eligible for instructor training programmes at the NVTI in Noida and the RVTIs in Mumbai, Bangalore, Thiruvananthapuram, Jaipur, Allahabad, Indore, and Vadodara. These programmes are available in non-engineering trades like dressmaking, computer-aided embroidery and needlework, fashion technology, architectural assistantship, and beauty culture and hairdressing. In response to the rapidly changing technological development, Mentor Councils were established which make recommendations for curriculum development, necessary equipment, pedagogy, and assessment of different courses provided by the Ministry of Labour and Employment. The Ministry has recognized the necessity to impart training to the existing VET teachers with the newly developed curricula and has even thought about the employment of technology-powered distance learning for this purpose. After a large-scale study of different technologies, DGT opted for a nationwide Internet solution. For the CTS program, 60,000 teachers are currently employed (20:1 pupil-teacher ratio), whereby the ITCs require about 5,000 new teachers per year.

#### Vocational education pedagogical competencies for teachers and trainers

Vocational education and training (VET), a distinct educational approach that emphasizes practical skills and hands-on experience, is centered on teachers and leaders. VET teachers typically need to have both pedagogical and occupational knowledge and experience, which is why they are frequently referred to as having a "dual profession". By teaching both transversal skills, such as basic and soft skills, as well as occupational skills, VET teachers prepare young people for the workforce. They assist students from many backgrounds, especially those who struggle academically, in making the transition from school to the workplace, as well as individuals who require new, updated, or better skills.

Institutional leaders in the VET sector have a critical responsibility to play in ensuring that this diverse group of students has access to high-quality instruction that helps them acquire the necessary skills. Students' academic progress and teachers' working circumstances are significantly impacted by the efficacy of VET institution leaders.

Leaders in the VET sector must be strategic, management-oriented, and well-versed in the variables that could influence the sector. Additionally, they must support more creative pedagogical, organizational, and institutional approaches while remaining current with developing technology that could enhance the efficiency of VET delivery (OECD, 2021).

The training programs for teachers in VET programs should reflect the reality that employees in today's workplaces need not just stronger basic, digital, and soft skills but also occupation-specific and technical abilities, as the skills VET teachers and trainers need are getting more complicated. For effective employment in the collaborative environments made possible by new technology, soft skills like communication, teamwork, and critical thinking are becoming more and more important. To deal with shifting labor markets and the rising threats of automation, basic skills like literacy, numeracy, and digital literacy are also crucial. The development of these abilities among students has to be facilitated by VET instructors (OECD, 2021).

VET instructors must encourage the development of digital and soft skills in their pupils given the growing demand for these talents on the labor market. Given that automation and digitalization are occurring throughout all economic sectors, digital skills are essential for modern occupations. In a same vein, soft skills like problem-solving, teamwork, verbal communication, and leadership are some of the most valuable talents for employees because they complement cognitive and technical skills and cannot be simply automated. Students with digital capabilities and soft skills have the adaptability to take on new occupations in a labor market that is constantly evolving. VET instructors should become more knowledgeable about how to help their students develop these abilities, particularly in practical settings, and include cutting-edge teaching strategies into their routines. Robotics, simulators, and other emerging technologies have the potential to encourage innovation in VET teaching and learning. These technological advancements are adaptable, economical, and secure learning tools. They support students in acquiring not just technical but also soft and digital skills (OECD, 2021) .

#### Technical and Vocational Education and Training (TVET) Trainers' Pedagogical Competency.

Enhancing the professionalism of trainers is one strategy for raising learning quality. It is very significant since educators play a key role in determining the standard of the educational system. Trainers need to possess the skills that influence trainees' performances and accomplishments. In order to meet demand, instructors must also be able to address the learners' needs. Pedagogical, personal, professional, and social competences are the four competencies of trainers' academic qualifications through trainer education, according to Minister of National Education Regulation No. 16 of 2007. These abilities are intended to materialize the need for raising the bar for education across the board. Educational and teaching credentials are referred to as pedagogical competence. One of the requirements for trainers is that they be able to oversee and direct the teaching and learning process in a classroom. Indicators of pedagogical competency include how well interactions flow, trainer performance, lesson planning skills, and appropriateness in selecting learning methods and media (Barasa, Manasi, & Wepukhulu, 2023).

This study aims to assess the core vocational teachers and trainers' competencies hard skills and soft skills that could be

#### **A-List of hard skills**

##### **1- Content:**

- Selecting/developing learning resources.
- Mastering practicum content.
- Organising content of subject matter.
- Designing learning material more interesting.
- Understanding content of lesson.

##### **2- Student**

- Motivating students.
- Understanding student characteristics.
- Planning educating lesson.

##### **3- Technology.**

- Having computer literacy.
- Using technological equipment.
- Using educational technology.
- Creating media.
- Using media and educational tools .
- Using ICT for teaching.
- Having knowledge of recent technology.

##### **4- Curriculum**

- Managing classroom.
- Understanding standard of learning competencies.
- Leading discussion.
- Writing lesson plan.
- Able to do research .
- Managing practicum.
- Involving in learning innovation.
- Planning assessment .
- Arranging theoretical lesson.
- Conducting lesson.
- Having information literacy.
- Accomplishing learning Administration.
- Understanding curriculum organization.
- Conducting contextual learning.
- Conducting assessment. (Wagiran, Pardjono, Suyanto, Sofyan, Soenarto, & Yudiantoko, 2019)

## **B- List of soft skills**

### **1-Methods of working**

- Teaching skills
- Communication skills.
- Cooperative.
- Implementing plans.
- Listening skills.
- Regeneration of pedagogical skills, using innovative teaching methods and trying new ways of teaching.
- Organising programs.
- Able to give advice.
- Able to share creative ideas .
- Able to speak foreign language.
- Report and evaluate activities.
- Report writing.
- Supple and polite in communication.
- Working durability.

### **2-Ways of thinking**

- Creative problem.
- Solving Critical thinking.
- Decision making.
- Time management.
- Willingness to learn.
- Working effectively.
- Written communication skill.
- Having global views.
- Interactive Leadership.
- Open minded.

### **3-Tools for working.**

- Able to analyse information.
- Able to create timetable.

- Able to plan programs.
- Able to use IT. (Wagiran, Pardjono, Suyanto, Sofyan, Soenarto, & Yudiantoko, Competencies of future vocational teachers: Perspective of in-service teachers and educational experts, 2019).

### Needs Assessment for Training

Both formal education and specialized training are undergoing major changes as a result of new professional demands and prerequisites. The rapid pace of scientific advancement in the evidence civilization, the accumulation of content knowledge necessary for invention, the shortening of the creative life succession, and rapidly evolving production techniques are some factors that appear to be bringing about an innovative environment for establishments. The requirement for workers to maintain their education is just one of the many effects of these demands. (Sani Mustapha Kura, 2021, p. 3389)

Training is a very powerful tool to improve employee knowledge and skills, which leads to higher business performance. It is also important to increase profits, production, and the speed of technology adoption. (Sani Mustapha Kura, 2021, p. 3389)

Through training, workers' abilities can be suitably enhanced, improving organizational and personnel outcomes. The needs of the learners must be carefully considered while designing training programs, and pertinent training topics must be chosen. It is commonly accepted that before beginning a training program, trainers should concentrate on the needs of the learner in order to lower the probability of failure. (Sani Mustapha Kura, 2021, pp. 3389, 3390)

Organizations should prioritize TNA (Training Needs Assessment) to get the most out of their limited training resources. TNA is thought to be an excellent method for increasing the effectiveness of exercise programs. However, financing issues, a lack of time, a shortage of human resource professionals, and managers' unwillingness to adopt TNA are viewed as major barriers to TNA. (Sani Mustapha Kura, 2021, p. 3390)

### Concept

Needs assessments serve as lighthouse beacons in the process of evaluating the gaps between a current learning or performance condition and the desired condition. It is a crucial step in the performance improvement business. It comes before the design and development of any human resource development (HRD) or human performance technology (HPT) initiative. Needs assessment is a process for examining and framing people related problems and performance improvement opportunities. It might be initiated in response to a problem or opportunity, or it might be used in ongoing learning or performance improvement efforts. Needs assessment can focus on one or more individuals, on people within units or teams, on people across job functions, or even on an entire organization. As part of interorganizational, local, national, and worldwide initiatives to improve education, development, and performance, needs assessments can also concentrate on issues connected to people and chances for improvement. (Gupta, 2007, p. 1)

TNA is the process of determining a company's training needs in order to increase employee work performance. It is defined as the systematic study of a problem or innovation, using data and opinions from various sources to make effective decisions or recommendations about what should happen next. A training needs assessment would ensure that training programs are targeted and suitable. Organizations must recognize the significance of understanding training requirements. For example, TNA addresses the issue of detecting actual gaps in the workforce's essential abilities in an orderly manner. Goals for determining how effective training is, as well as present plans and plans of the company on employee skill requirements. To improve the assessment, existing and prior training programs must be reviewed to determine their strengths

and limitations in making the present program more effective. Education is an investment in people, and investing in people is an investment in the company, but an organization must ensure that training resources are targeted into areas where training is needed and a favorable return is ensured. (Sani Mustapha Kura, 2021, pp. 3390, 3391)

Needs assessment (front-end analysis) is a sibling to objectives-based program evaluation (back-end analysis). The training process begins with a needs assessment. It is the phase in which the needs of an organization are determined, laying the groundwork for an efficient training endeavor. The requirements assessment identifies where and what types of training programs are required, who should be included, the conditions under which training will take place, and the criteria to drive program evaluation. Organization, task or operations, and individual are the three layers of requirements analysis. (Anderson, 2000, p. 9)

Organizational analysis highlights areas where training is required and where it should take place. An organization analysis should identify the following: (a) organizational goals and strategy, (b) organizational resources and resource allocation, (c) organizational training climate transfer, and (d) environmental restrictions (legal, social, political, and economic). The goal is to connect strategic planning with training and identify inefficient organizational units in order to establish whether training is the antidote to the performance problem. (Anderson, 2000, pp. 9, 10)

Task analysis describes the content of the training. It is a systematic collection of data about a specific job to determine the knowledge, skills, and attitudes required to achieve optimum performance. The essence of the common elements is to: (a) prioritize the areas that can benefit from training, (b) develop an overall job description, (c) describe knowledge skills attitudes (KSAs) needed to perform the task, (d) identify the task (ideal job performance and actual job performance the difference being the performance gap), and (e) identify areas that can benefit from training. (Anderson, 2000, p. 10)

Person analysis determines who should be trained and what type of training is required. Person analysis is separated into two parts: (a) summary person analysis, which determines the overall success of employee performance, and (b) diagnostic person analysis, which determines the reasons for employee performance by examining if there is a skill, motivation, or work-design problem. Personal analysis, on the other hand, has a number of potential drawbacks, the most significant of which are that it is both expensive and complex, and management's capacity to make correct judgments/performance assessments is uncertain. (Anderson, 2000, p. 10)

### **Approaches:**

Supply-led approach to TNA The information is available from a variety of sources. Scholars refer to the "pedagogical" or "supply-led" method as one significant source of knowledge about training needs. This strategy is predominantly trainer-driven and authority-oriented, stemming from trainers' vested interests. Trainers are traditionally in charge of identifying training needs, and the scope of the evaluation might extend to any level of the business. To assess training needs, trainers frequently use a skill model or taxonomy as a framework to assist build a list of tasks, and then ask job incumbents to indicate their training needs for each item on the list. However, this approach may unintentionally create issues into the requirements assessment process. Trainers frequently lack line management experience and are unaware of real operational challenges. Inaccurate characteristic labels and broad behavioral descriptions are frequently captured by the skill model. These trait labels and behavioral descriptions may merely represent the trainers' preconceived notions about the profession, which may or may not correspond to those of the potential trainees. (Warren Chiu, 1999, pp. 77, 78)

Demand-led approach to TNA Business-oriented. The supply-led approach of TNA has been increasingly challenged by developments in the business sector that emphasize the "bottom line", profitability, expansion,

and so on. This leads to sources of training information such as the organization's business plan. TNA is defined as a "rational process by which an organization determines how to develop or acquire the human skills it needs in order to achieve its business objectives"; thus, it is anticipatory in nature, with the goal of meeting long-term organizational objectives. This was discovered via a "demand-led" method. Top executives and directors are thought to be committed to investing in training since they recognize its importance to the success of the firm. The key to the approach is seen to be the business planning process, which establishes the context and mission of the organization. As a result, the context for training is identified, as is how the training effort is connected with the larger business goal. Demand-led training advocates for requirements analysis approaches such as management by objectives (MBO) as a means of connecting individual goals with business goals and identifying areas where the individual may require training to fulfill his or her goals. To summarize, this business-oriented strategy is distinguished by a top-down, finance-driven process (e.g., profit, growth) that focuses on the company outcome rather than the requirements of the employees. (Warren Chiu, 1999, p. 78)

Process-oriented. Besides the business-oriented approach, we propose that the "demand-led" aspect of TNA has another counterpart – the process-oriented approach. In terms of scope and emphasis, the process-oriented approach differs from the business-oriented approach. While the business-oriented strategy focuses on the entire organization, the process-oriented approach concentrates on a specific division or department. Training requirements frequently occur as a result of the implementation of new processes in a subdivision of an organization, such as business process reengineering, total quality management (TQM), or ISO 9000. The goal of identifying training needs at this level is to ensure that new work processes can be implemented effectively and efficiently. (Warren Chiu, 1999, pp. 79, 79)

Trainer-centered. The "demand-led" approach (i.e., business and process oriented) may be contrasted with a more trainee-centered approach or what is described as the "andragogical" approach. In contrast to the "demand led" strategy, the trainee-centered approach is defined by a bottom-up, self-development driven (e.g., performance, promotion) emphasis on employees' needs rather than the business outcome or work efficiency. The trainee-centered method frequently focuses on self-evaluation as a source of information. According to the research findings, self-evaluation may be a true reflection of trainees' development requirements and can be recognized as an important component of a legitimate needs assessment process. However, self-assessment of training needs is also heavily criticized because it may reflect learners' training desires but not actual training needs. Trainees are more forgiving with their ratings and make more attributions (i.e., excuses) to the external environment. All these tendencies would inevitably undermine the accuracy of the TNA data. (Warren Chiu, 1999, p. 79)

#### Tools for Collecting and Analyzing Data:

Some data-collection methods are interviews, focus groups, surveys, observations, and archival records.

#### **1- Interviews**

Some people believe that interviews are one of the most straightforward strategies for acquiring information about learning and performance requirements. A simple conversation with customer support representatives may reveal reasons why phone calls are not being handled appropriately. A thorough dialogue with senior management could help to clarify viewpoints on strategic training concerns. However, such interviews can be difficult; conducting meaningful interviews requires a certain level of expertise and skill. (Gupta, 2007, pp. 44, 45)

#### **Types of Interviews**

Interviews can be conducted in person, over the phone, or through computer technologies (such as webcams, videoconferencing, and instant messaging). The most significant advantage of one-on-one, in-person



interviews is the personal interaction that occurs. In-person interviews allow the interviewer to see respondents' facial expressions and other nonverbal indicators. (Gupta, 2007, p. 45)

Phone interviews are important when persons in faraway regions are difficult to reach. They're also beneficial when folks don't have the time or resources to meet in person. Because most people will decline to participate in lengthy phone interviews, phone interviews are usually limited to thirty minutes. Time constraints definitely limit the amount of information that may be acquired. When extensive debate is likely, a phone interview is not the best option. (Gupta, 2007, p. 45)

Computer-aided telephone interviewing can be utilized for some interviews; text appears on the interviewer's computer screen, along with the response possibilities, and the interviewer can enter the interviewee's responses. When participants are comfortable using technology such as web cameras and video conferencing, computer-supported interviews can be a useful alternative to computer-aided telephone interviews. The interviewer can observe nonverbal cues with these aids, as with in-person interviews, and participants do not have to travel to meet in person, as with phone interviews. (Gupta, 2007, p. 45)

Whether conducting interviews in person, by phone, or by using computer technology, it is useful to remember the following tips:

- Use a neutral tone.
- Use clear enunciation
- Avoid speaking too quickly.
- Maintain the discussion's focus.
- Seek additional answers to your questions. (Gupta, 2007, pp. 45, 46)

Keys to a successful interview include planning for it and crafting questions before the interview. Some people prepare for the interview before developing questions while others generate the questions first. (Gupta, 2007, p. 46)

## **2- Focus Groups**

The focus group interview method gathers people who have something in common and asks them for their opinions and ideas on a given issue. Most focus groups consist of five to eight participants. (Gupta, 2007, p. 46)

To be effective, focus groups require skilled facilitators. A facilitator must be psychologically prepared, be knowledgeable with strategies such as the five-second pause and asking for further information, and be able to show participants positive regard and empathy. Facilitators of focus groups must remember that they are not topic experts, mediators, arbitrators, or judges. It is recommended that facilitators include the following:

- Accept responses without being judgmental.
- Avoid making decisions or comments regarding the work of a group.
- Foster an environment of openness and mutual respect.

The job of performing needs assessments through focus groups is divided into three stages: preparation, execution, and reporting. (Gupta, 2007, p. 49)

## **3- Surveys**

It is challenging to create good surveys. Following a systematic approach helps to ensure that the goals and desired outcomes are met. The stages of surveying needs are as follows:

- Prepare.
- Design.
- Create questions.
- Produce written instructions.
- Create a cover letter.
- Run a pilot test.
- Carry out the survey and follow up. (Gupta, 2007, p. 51)

#### **4- Observation**

Observation is another method used to collect data during needs assessments. When applied methodically, observation can produce useful results. Observational data, like interview data, can be collected in an organized or unstructured manner. The duration of the observation, whether structured or unstructured, is determined. Prior to the observation, structured observations make decisions about which factors will be examined. An analyst, for example, could use structured observation to track the number of staff in a kitchen who wash their hands before preparing meals. The analyst gathers information on all aspects of interest in a situation using unstructured observations. For example, the analyst may monitor and document all relevant behaviors in the same kitchen. (Gupta, 2007, p. 60)

Structured observations provide the following advantages:

- They limit the possibility of bias.
- They improve the dependability of observations.
- They give an accurate method of reporting data. (Gupta, 2007, p. 60)

The unstructured method is utilized to get a first impression of a problem. Following that, conduct a structured observation.

One difficulty with observation, whether structured or unstructured, is that people frequently change their behavior when they are being observed by others. Use subtle approaches to avoid this issue. Observe people from an unobtrusive location, for example. You can lessen anxiety by wearing in clothing similar to people you are observing. (Gupta, 2007, p. 60)

Notes documenting unstructured observation are typically kept on notepaper or in a computer file labeled with the observer's name, location, and time of observation. Forms are usually used to record structured observations. Here are some pointers for developing structured observation forms:

- Include the observer's name, as well as the date and place of the observation.
- Include a checklist of items to observe, such as the specific activities and subtasks performed during your observation, as well as the frequency of performance or the length of time required to complete a task. Include the start and end times as well.
- Include space on the checklist for both qualitative and quantitative data.
- Make room for comments and other remarks. (Gupta, 2007, p. 62)

## 5- Documents and Artifacts

Another vital source of information in needs assessments are the data contained in current and historical documents and other artifacts such as business plans, mission statements, job descriptions, performance reviews, Web sites, training evaluation forms, sales records, customer service call records, personnel records, budgets, and photographs. Such information can be either qualitative or quantitative. When such data are collected in conjunction with another data-gathering approach, the utility of collecting such data is maximized. Here are some pointers for utilizing data from documents and artifacts:

- Before conducting a thorough record search, be clear about the type of information you are looking for.
- Seek authorization before using archival or company records.
- Examine the data for trends and patterns.(Gupta, 2007, p. 63)

### Methodology and Tools

Since the current study is looking into the pedagogical needs assessment of teachers at the Advanced technology schools, the study used the mixed research method that utilised both qualitative and quantitative research tools.

#### Quantitative and Qualitative Tools for Needs Analysis :

**Quantitative tools:** which are commonly employed across diverse domains, serve as vital analytical instruments and methods that enable the collection, analysis, interpretation, and presentation of data in a numerical or quantitative format. These tools are of utmost importance as they facilitate the process of making well-informed decisions, conducting extensive research, and effectively resolving intricate problems that arise within various contexts (Almalki,2016, p. 290) (Lakshman, et al., 2000, p.369).

**Quantitative tools play a crucial role in needs analysis by providing objective and measurable data that can inform decision-making processes. Here are some key roles of quantitative tools in needs analysis** (Nasir,Sukmawati,2023,pp.369-370) (Bhat & Bhat, 2019, pp.782-783) (Eyisi, 2016, p.94) (Martí, 2016, p.2):

1. **Objectivity and Standardization:** Quantitative tools provide the means for gathering data in a standardized manner, thereby fostering objectivity and enabling comparisons to be made across various individuals, groups, or contexts. quantitative tools contribute to the establishment of a consistent approach in both data collection and analysis, thereby mitigating the potential for biases to influence the assessment of needs.
2. **Large-Scale Data Collection:** The utilization of quantitative methodologies, such as surveys or questionnaires, presents an opportunity to efficiently amass a significant amount of data from a vast number of participants. thus providing a holistic understanding of the phenomenon under investigation.
3. **Statistical Analysis:** The analysis of quantitative data can undergo a wide array of statistical analyses, thereby offering substantive and profound insights into the various patterns, relationships, and trends that may be present.
4. **Quantifiable Metrics:** The utilization of quantitative tools permits the meticulous measurement and quantification of numerous aspects that pertain to needs. These meticulously formulated metrics provide a lucid and measurable indication of the extent to which needs are being met or whether they necessitate immediate attention.
5. **Data-driven Decision Making:** The utilization of quantitative tools offers an empirical and evidence-based approach that can significantly inform the process of data-driven decision making. Furthermore, the effectiveness of implemented strategies can be accurately and thoroughly evaluated via the utilization of quantitative data, thereby ensuring that decisions are firmly grounded in evidence rather than being premised on subjective opinions or unwarranted assumptions.
6. **Comparative Analysis:** The utilization of quantitative tools effectively facilitates the process of comparative analysis by enabling the comprehensive and thorough comparison of data across

different groups, locations, or time periods. Additionally, this process can enable the efficient allocation of valuable resources by duly taking into account any identified disparities.

- 7. Predictive Modeling:** The utilization of quantitative tools, including advanced techniques such as predictive modeling or forecasting, can proficiently anticipate future needs based on the thorough analysis of historical data and trends.

It is of paramount importance to duly acknowledge and recognize that whilst quantitative tools provide invaluable and indispensable insights, it is absolutely crucial to complement these tools with qualitative methods in order to effectively and comprehensively gain a more holistic and comprehensive understanding of needs. The incorporation and integration of both quantitative and qualitative approaches ensures the formulation and implementation of a well-rounded and all-encompassing needs analysis that duly takes into consideration both objective data and subjective experiences (Bhat & Bhat, 2019, p.779).

**Quantitative tools can be used effectively for needs analysis to gather objective data and measure various factors. Here are some commonly used quantitative tools for needs analysis (Phillips & Phillips, 2016, pp.154-155) (حسنیٰ 2001):**

- 1. Surveys/Questionnaires:** Surveys are commonly used to collect numerical data and have become popular. They consist of a set of organized questions that can be given to a large group of people. Surveys gather various information such as demographics, preferences, opinions, and satisfaction levels, which are important for analyzing needs.
- 2. Interviews:** Interviews are a way to collect data that focuses on individual experiences. However, they can also be used for quantitative research. In this approach, participants are asked a set of predetermined questions. The responses can then be quantified and analyzed using predefined categories or scales. This allows researchers to obtain numerical representations of the data.
- 3. Observations:** Observational studies involve observing and recording data on behaviors or activities. This process requires a thorough examination and documentation to ensure accuracy. Quantitative approaches allow researchers to assign codes or ratings to behaviors, facilitating a deeper understanding. This methodology is useful for analyzing complex tasks and gaining insights into the subject matter.
- 4. Performance Metrics:** Performance metrics are used as quantitative indicators to measure the effectiveness or efficiency of processes or systems. Analysis of performance metrics helps identify areas of deficiency or inadequacy that require enhancements or modifications.
- 5. Comparative Analysis:** The process of comparative analysis involves carefully examining and scrutinizing distinct groups, locations, or time periods to understand their differences and similarities. This rigorous approach includes a quantitative assessment of diverse groups and examining changes over time. This practice helps gain a deeper understanding of specific demands and variations in different contexts.
- 6. Tests:** Tests are useful for needs analysis in various environments, including education and vocational training. Needs analysis involves evaluating the abilities and skills of a specific target group, identifying and addressing any gaps or deficiencies, and establishing a framework for training or interventions.

**Qualitative tools** refer to a set of analytical methods and techniques that are employed for the purpose of gathering, examining, and interpreting data that is not expressed in numerical form during the course of research and decision-making endeavors. These tools play a significant role in shedding light on the intricacies, connotations, and subjective facets associated with a specific phenomenon under investigation. The utilization of qualitative research is particularly prevalent within the domains of social sciences, humanities, and other diverse areas where comprehending human behavior, perceptions, and experiences stands as a fundamental requirement (Almalki, 2016, p. 291) (Lakshman, et al., 2000, pp.371-372).

**Qualitative tools play a crucial role in needs analysis by providing in-depth insights into individuals' experiences, perspectives, and underlying motivations. Here are some key roles of qualitative tools in needs analysis** (Eyisi, 2016, pp.92-93) (Starman,2013, pp.36-38) :

1. **Exploring Complexity:** The study of complexity is made easier by using qualitative tools, which allow researchers to thoroughly explore complex needs by gathering detailed and nuanced information. These tools include interviews, focus groups, and open-ended survey questions, which allow participants to express their needs using their own words. This approach provides a comprehensive understanding of the contextual factors, emotional aspects, and underlying determinants associated with these needs.
2. **Uncovering Unarticulated Needs:** Qualitative tools are effective in uncovering unarticulated needs. They help individuals express needs they may not be aware of. Open-ended discussions and active listening assist in this process. Quantitative approaches may not be as effective.
3. **Contextual Understanding:** Qualitative tools allow for a thorough investigation of social, cultural, and environmental contexts. Researchers can gain a deep understanding of how needs are influenced by various factors. This comprehension enables tailored interventions to address specific needs.
4. **Participant-Centered Approach:** The participant-centered approach in qualitative tools emphasizes the importance of participant perspectives. Qualitative tools respect the diversity of experiences and voices by listening and allowing participants to share their narratives. This approach ensures comprehensive needs analysis and captures the unique characteristics of individuals or groups.
5. **Generating Hypotheses and Theory Development:** Qualitative tools are important for generating hypotheses and developing theory due to their ability to provide researchers with detailed data. Techniques like thematic analysis and grounded theory uncover patterns and frameworks that guide future investigations. The use of qualitative tools enhances understanding and knowledge in a specific field, advancing scholarly inquiry and expanding scientific knowledge.
6. **Validating and Complementing Quantitative Findings:** Qualitative tools can validate or complement quantitative findings by providing supplementary insights or explanations. Engaging in triangulation of qualitative and quantitative data allows researchers to corroborate or contextualize the quantitative results, enhancing the overall validity and comprehensiveness of the needs analysis.
7. **Stakeholder Engagement and Collaboration:** The use of qualitative tools in stakeholder engagement helps involve individuals or communities in needs analysis. Participatory methods and co-design approaches ensure stakeholder voices are valued, fostering ownership and accountability. This leads to more relevant and effective interventions.

By employing qualitative methodologies for conducting needs analysis, organizations have the opportunity to delve into the intricacies of individuals' requirements, desires, and ambitions, thereby acquiring a more comprehensive comprehension of their needs. These valuable insights can then be utilized to inform the process of formulating and implementing targeted interventions, policies, or services. By addressing the fundamental motivations that underpin these identified needs, organizations are able to devise impactful and purposeful solutions that effectively cater to the specific requirements of the individuals involved.

**Qualitative tools are valuable for needs analysis as they allow for in-depth exploration and understanding of individuals' perspectives, experiences, and underlying motivations. Here are some commonly used qualitative tools for needs analysis** (Fetters, et al, 2013, pp.2137-2138) (Starman,2013, pp.29,31) (حسنیٰ) (2001 (Lakshman,et al., 2000, p.374) :

1. **Interviews:** Interviews are widely used for needs analysis, involving open-ended questions and follow-up probes to gather detailed responses. Individual or group interviews can explore needs, desires, challenges, and suggestions. Interviews can be structured, semi-structured, or unstructured, depending on the desired level of flexibility needed to uncover insights.
2. **Focus Groups:** Focus groups involve gathering a small number of people to discuss a specific topic. This method allows for interactive exploration of ideas and generates new insights. It also helps

examine collective experiences and group dynamics, leading to a comprehensive understanding of needs in a specific context.

3. **Observations:** Observations are a vital method in scientific research involving watching and documenting behaviors, interactions, and activities in a natural or controlled setting. This tool allows researchers to directly witness and record needs-related behaviors, challenges, and environmental factors that can influence individuals. Observations can be done in person or through video recordings, providing real-time or revisitable data. They gather rich qualitative data that complements self-reported needs.
4. **Surveys with Open-Ended Questions:** Surveys with open-ended questions allow for the collection of both quantitative and qualitative data. Open-ended questions encourage detailed responses and provide a deeper understanding of individuals' needs. This qualitative data goes beyond predetermined response options.
5. **Diaries or Journals:** Providing individuals with diaries or journals can generate valuable qualitative data. Diaries and journals capture the dynamic nature of needs in real-time. These tools allow researchers to observe how needs evolve over time. They also provide insights into subjective experiences and personal contexts.
6. **Case Studies:** Case studies involve a thorough investigation and analysis of a specific individual, group, or organization. This qualitative tool allows researchers to explore unique needs and underlying causes. Case studies also consider contextual factors and utilize multiple sources of data. Researchers gain a comprehensive understanding of the needs being investigated.

The synthesis of qualitative and quantitative methodologies has the potential to yield a comprehensive comprehension of various needs, as each respective approach possesses distinct and valuable attributes and viewpoints that contribute to the examination and evaluation of the subject matter at hand (Fetters, et al, 2013, p.2135).

#### Study Procedures

The study followed the following procedures:

- 1- Identifying Target schools. The Ministry of Education and Technical Education has identified 5 target schools that were established in the first batch of ATS schools in 2018, with effective partnership with industry within greater Cairo region from 3 governorates (Cairo, Giza and Qaliobeya)
- 2- Conducting a survey on Teachers to assess their perspectives on their training needs in the pedagogical competencies for ATS schools.
- 3- Conducting a focus group interviews with industry representatives and school leaderships on the teachers' pedagogical competencies.

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## **Chapter Two: Instruments and Methodology of the Study**

### **Introduction:**

In the previous sections, the study covered the theoretical frameworks of vocational education, applied technology schools, their objectives, importance, and educational foundations. It also addressed the social dimensions that contributed to the emergence of these schools. Additionally, the study provided some detailed information about the educational efforts made in partnership with major private sector companies in these schools to achieve the principle of work-based learning, which produces a competitive individual with a balanced personal character and strong foundational skills.

This chapter focuses on describing the methods and procedures followed in implementing the practical aspect of the research project. It includes the study's population and sample selection method, the study's tools used, the validity and reliability testing procedures, the steps followed in the implementation phase, and the statistical analysis used to analyze the study's data to reach the final study results. The following provides a description of these steps.

### Objectives of the Field Study

The Ministry of Education, in partnership with Helwan University, Finnish partners from HAMK University, and a German company (IHKPG), adopted the "Advanced Teacher Competencies to Improve Vocational Education in Applied Technology Schools" project to:

- Provide an outstanding learning environment for students and teachers in schools or practical training sites.
- Enable teachers to prepare graduates qualified to work in local and international markets.
- Prepare the best teachers and counselors according to the latest international systems and standards.

Therefore, the project aims to enhance the ability of TVET teachers and trainers to work in the competency-based vocational education system, which is implemented in collaboration with the world of work.

### Field Study Procedures

Field study procedures refer to the systematic and organized steps undertaken during the data collection phase of a research study conducted in a real-world setting or "field." These procedures are designed to gather firsthand information and observations from participants or subjects within their natural environment, allowing researchers to study and analyze real-life behaviors, experiences, and phenomena.



## Study Methodology

To achieve the objectives of this study and complete its procedures, a "descriptive methodology" was used to study the theoretical framework of vocational education, to examine applied technology schools in Egypt, and to identify the training needs of teachers and trainers in those schools.

In addition, a "mixed methodology that combines quantitative and qualitative methods" was used. The quantitative methodology uses statistical and mathematical methods to collect and analyze data, relying on digital and statistical measures to analyze social, psychological, and behavioral phenomena. The qualitative methodology uses descriptive, interpretive, and qualitative analysis to collect data, exploring social, psychological, and cultural phenomena in more depth and detail, and understanding the factors influencing the phenomena studied.

In this study, the quantitative and qualitative methodologies were used simultaneously within the framework of the mixed methodology approach. The quantitative methodology was used to obtain standardized results and precise numbers, while the qualitative methodology was used to clarify the conceptual and cultural details of the phenomena studied.

### 2. Study Instruments

A set of study instruments (questionnaires and focus group interview cards) was designed and prepared. These instruments were subjected to expert review by specialists in the field to ensure their validity and reliability using well-known statistical methods.

### 3. The study population

The study community consists of teachers and trainers from the Applied Technology Schools in Egypt.

### 4. Study Sample

A study sample refers to a subset of individuals or subjects from a larger population that are chosen to participate in the study.

- **Pilot Sample:** The pilot study was conducted on two Applied Technology Schools: We School for Applied Technology in Sheikh Zayed, and Ghabbour 2 School for Applied Technology.

**Table 1: The number of participants in the pilot study**

Pilot Study					Study Community
Interviews			Questionnaires		Total Number
Parents	Companies	School Leaders	Trainers	Teachers	55 Teachers and Trainers (25 Teachers + 30 Trainers)
10	1	1	28	24	

The appropriate sample size for applying the study tools was determined using Thompson's equation for calculating the study's sample size (Thompson, 2012, 59-60).

- **Main Sample:** The project will be implemented in collaboration with five Applied Technology Schools: Imam Mohamed Metwally Al-Shaarawy School for Applied Technology, Volkswagen School for Applied Technology,

Electro Misr School for Applied Technology, Mechatronics School for Applied Technology, and We School for Applied Technology.

**Table 2: The number of participants in the main study**

Main Study					Study Community
Interviews			Questionnaires		Total Number
Parents	Companies	School Leaders	Trainers	Teachers	111 Teachers and Trainers (76 Teachers + 35 Trainers)
50	5	5	33	64	

The appropriate sample size for applying the study tools was determined using Thompson's equation for calculating the study's sample size (Thompson, 2012, 59-60).

The actual implementation of the main study included (70) teachers and (48) trainers, which exceeded the targeted number of (6) teachers and (15) trainers. The total increase in participants was (21) teachers and trainers. This increase can be attributed to the high enthusiasm and interest shown by the teachers and trainers, driven by their strong awareness of the project's importance in enhancing their professional development and improving their teaching efficiency.

## 5. Data collection Instruments

The following tools have been designed and prepared:

- a) **Questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view:** A standardized questionnaire was prepared on Professional Competencies, and its questions revolved around teachers' opinions on the most important professional competencies those teachers and trainers of applied technology schools should possess.
- b) **Questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Trainers' point of view:** A standardized questionnaire was prepared on Professional Competencies, and its questions revolved around Trainers' opinions on the most important professional competencies those teachers and trainers of applied technology schools should possess.
- c) **Interview Form with School Leaders about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS):** A semi-standardized oral interview form has been prepared about Professional Competencies for Teachers, and its questions revolve around the opinions of school leaders regarding the most important professional competencies that teachers and trainers of applied technology schools should possess.
- d) **Interview Form with companies about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS):** A semi-standardized oral interview form has been prepared about Professional Competencies for Teachers, and its questions revolve around the opinions of companies regarding the most important professional competencies those teachers and trainers of applied technology schools should possess.
- e) **Interview Form with parents about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS):** A semi-standardized oral interview form has been prepared about Professional Competencies for Teachers, and its questions revolve around the opinions of

parents regarding the most important professional competencies those teachers and trainers of applied technology schools should possess.

These tools are designed to gather data and information about the training needs of teachers and trainers in Applied Technology Schools.

## **6. Piloting tools used for training needs assessment**

Pilot study, or pilot test is a small-scale preliminary research project carried out before the major study to assess several facets of the research concept and methods. Its main goal is to spot potential problems, hone research techniques, and compile information that can assist researchers in making judgments about doing a larger, more thorough study (Lowe, 2019, 117-118).

### **Key characteristics of a pilot study**

The following are important characteristics of the pilot study:

- a) **Small Sample Size:** In comparison to the main study, pilot studies normally only include a small number of individuals. Depending on the goals of the study, the sample size may change, but it is typically lower.
- b) **Testing Techniques:** The research techniques and methodologies that will be applied in the main study are tested in the pilot study. This involves evaluating experimental techniques as well as data collection tools (such as surveys or questionnaires).
- c) **Feasibility Assessment:** Researchers evaluate the study's viability, including the practicalities of recruiting participants and collecting, gathering, and analyzing data. This aids in identifying any potential difficulties or constraints.
- d) **Refinement of Methodology:** The research design is adjusted using the data gathered during the pilot study. Researchers may modify the study's procedures, instruments, or sample size based on the insights gained from the pilot.
- e) **Data analysis:** Although the primary goal of a pilot study is not to draw conclusive conclusions, researchers may analyze the data collected to identify trends or patterns that could inform the main study.
- f) **Ethical considerations:** Pilot studies also help researchers to identify any ethical issues that may arise in the main study, allowing them to make necessary adjustments to protect the rights and well-being of participants.
- g) **Time and cost efficiency:** Conducting a pilot study can save time and resources by helping researchers avoid potential pitfalls and errors that may occur in a larger study (Beebe,2007,213-218) (Johanson & Brooks,2010, 394-400).

Overall, pilot studies are crucial for making sure that the primary study is well-planned, effective, and adheres to strict scientific standards. Before devoting a considerable amount of time and resources to a comprehensive examination, it enables researchers to foresee difficulties and make required adjustments.

### **Psychometric Properties for Questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view**

The researchers verified the availability of the psychometric conditions (validity, reliability) of questionnaire as follows:

#### ***The questionnaire's Validity***

In this research, the researchers relied on the validity of the jury members to emphasize the validity of the content, and validity of internal consistency, the following is an explanation for this:

1. **Validity by the Jury (Content Validity):** The researchers presented questionnaire in its initial form to (5) specialists in the field of Curriculum& teaching methods, and comparative education to express their opinions on the appropriateness of the questionnaire, Based on the viewpoints agreed upon by the jury members, The jury members have provided some comments, which were taken into account and modified according to their opinions. One of the most important adjustments was made to some wordings. Moreover, the jury members agreed that the questionnaire items are suitable for their intended purpose (Defining the professional competencies required for teachers in applied technology schools). The researchers anticipated the items that the judges agreed were suitable with a percentage of (80.00% and more).

The following table (3) illustrates the ration of agreement among the jurors on the dimensions of the questionnaire and its included items.

**Table 3: The ratio of agreement among the jurors on the questionnaire**

S	Questionnaire Competencies	Ratio of Agreement
1	First: The Cognitive Competencies	93,33%
2	Second: The Teaching Competencies	92.00%
3	Third: The Assessment Competencies	92.00%
4	Fourth: Competencies related to Vocational and Technical Training and Education	92.50%
<b>ratio of agreement to questionnaire as a whole</b>		<b>92.46%</b>

Cooper's equation has been used to calculate the percentage of agreement among the jury members. The rate of agreement among the jurors on validation Competencies of questionnaire ranged between (92.00% - 93.33%), as the percentage of agreement on questionnaire as a whole reached (92.46%), which is a high percentage indicating the validity of questionnaire, after making the modifications approved by the jury members, which included an amendment to the formulation of some questionnaire items, The researchers made the modifications referred to by the jury members, and thus the final questionnaire became consist (4) dimensions of Competencies, after making the modifications approved by the jury members.

## 2. Internal consistency validity

The internal consistency was calculated by applying questionnaire to the pilot sample those consisted of (24) individuals from outside main sample as follows:

- 1) **Calculation of correlation coefficients among questionnaire items and total score of questionnaire dimensions each dimension separately:**

**Table 4: Correlation coefficients between questionnaire items and questionnaire**

Cognitive Competencies		Teaching Competencies		Assessment Competencies		Competencies related to Vocational and Technical Training and Education	
Items	Correlation Coefficient of questionnaire items and questionnaire dimensions	Items	Correlation Coefficient of questionnaire items and questionnaire dimensions	Items	Correlation Coefficient of questionnaire items and questionnaire dimensions	Items	Correlation Coefficient of questionnaire items and questionnaire dimensions
1	0.801*	1	0.487*	1	0.715*	1	0.570*
2	0.719*	2	0.800*	2	0.488*	2	0.805*
3	0.825*	3	0.713*	3	0.850*	3	0.813*
4	0.850*	4	0.819*	4	0.641*	4	0.824*
5	0.748*	5	0.625*	5	0.593*	5	0.716*
6	0.810*	6	0.718*			6	0.813*
7	0.818*	7	0.777*			7	0.655*
8	0.641*	8	0.847*			8	0.812*
9	0.724*	9	0.815*				
		10	0.800*				

\* Correlation is significant at the at level (0.05)

The table (4) shows the correlation coefficients between questionnaire items and questionnaire dimensions each dimension separately have ranged between (0.487) and (0.850), all of which are a statistical significant at the level of (0.05).

**2) Calculation of correlation coefficients between total score of questionnaire dimensions and overall score of questionnaire:**

**Table 5: Correlation coefficients between total score for each questionnaire**

Questionnaire Dimensions	Correlation Coefficients
First: The Cognitive Competencies	0.896*
Second: The Teaching Competencies	0.953*
Third: The Assessment Competencies	0.899*
Fourth: Competencies related to Vocational and Technical Training and Education	0.886*

\* Correlation is significant at the at level (0.05)

The table (5) shows the correlation coefficients between overall score of questionnaire and total score for each dimension which ranged between (0.886) and (0.953), all of which are a statistical significant at the level of (0.05).

It is clear from previous tables (4) (5) that the coefficients of correlations between the items and the total degree for each dimension separately, as well as between the total score for each dimension and the total score of questionnaire are all statistically significant at the level of (0.05); this indicates the correlation and coherence of the items, dimensions and questionnaire as a whole, which indicates that questionnaire It has internal consistency.

### ***The questionnaire's Reliability***

The reliability of questionnaire was calculated in a number of ways, Cronbach's Alpha , and Split-Half, as follows:

- A. Cronbach's Alpha:** researchers used this method to calculate the reliability of the test by applying it to a sample of (24) male and female from Teachers in Applied Technology Schools (ATS). The following table (4) shows reliability coefficients for each dimension of questionnaire as well as total score using Alpha coefficient. Cronbach's Alpha coefficients for value of Cronbach's Alpha for whole questionnaire was (0.848).

**Table 6: Results of The reliability coefficient values by Cronbach's Alpha**

Questionnaire Dimensions	Number of items	Cronbach's Alpha Coefficient
First: The Cognitive Competencies	9	0.800
Second: The Teaching Competencies	10	0.783
Third: The Assessment Competencies	5	0.797
Fourth: Competencies related to Vocational and Technical Training and Education	8	0.802
<b>Questionnaire as Whole</b>	<b>32</b>	<b>0.848</b>

These values indicate that the questionnaire enjoys an appropriate level of reliability for determining the necessary professional competencies of teachers in applied technology schools.

- B. Split-Half:** The questionnaire's reliability coefficient was calculated using the split-half method. The pilot sample responses were first separated into two halves, and then the scores of the entire questionnaire were divided accordingly. Pearson correlation coefficients were then calculated between the scores of the two halves. These correlations were subsequently adjusted using the Spearman-Brown formula, as shown in Table (5).

**Table 7: Results of reliability coefficient values by Split-Half**

Questionnaire	Number of Items	Correlation between Forms (Pearson)	Reliability Coefficient after Correction (Spearman-Brown)
Questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view	32	0.770	0.905

These values indicate that the questionnaire possesses an appropriate level of reliability to determining the necessary professional competencies of teachers in applied technology schools. Consequently, the overall questionnaire reliability is confirmed. It is evident from the table (7) that the values are suitable, trustworthy, and indicate the validity of the questionnaire for application.

#### **Psychometric Properties for Questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Trainers' point of view**

The researchers verified the availability of the psychometric conditions (validity, reliability) of questionnaire as follows:

### **The questionnaire's Validity**

In this research, the researchers relied on the validity of the jury members to emphasize the validity of the content, and validity of Internal consistency, The following is an explanation for this:

**A. Validity by the Jury (Content Validity):** The researchers presented questionnaire in its initial form to (5) specialists in the field of Curriculum& teaching methods, and comparative education to express their opinions on the appropriateness of the questionnaire. Based on the viewpoints agreed upon by the jury members, the jury members have provided some comments, which were taken into account and modified according to their opinions. One of the most important adjustments was made to some wordings. Moreover, the jury members agreed that the questionnaire items are suitable for their intended purpose (Defining the professional competencies required for teachers in applied technology schools). The researchers anticipated the items that the judges agreed were suitable with a percentage of (80.00% and more).

The following table (8) illustrates the ration of agreement among the jurors on the dimensions of the questionnaire and its included items.

**Table 8: The ration of agreement among the jurors on the questionnaire**

<b>S</b>	<b>Questionnaire Competencies</b>	<b>Ratio of Agreement</b>
<b>1</b>	First: The Technological Competencies	90,00%
<b>2</b>	Second: The Professional Competencies	91.43%
<b>3</b>	Third: Performance Competencies	92.50%
<b>4</b>	Fourth: The Teaching Experiences	91.25%
<b>5</b>	Fifth: The Environmental and Community Work Experiences	94.29%
<b>ratio of agreement to questionnaire as a whole</b>		<b>91.89%</b>

Cooper's equation has been used to calculate the percentage of agreement among the jury members. The rate of agreement among the jurors on validation Competencies of questionnaire ranged between (90.00% - 94.29%), as the percentage of agreement on questionnaire as a whole reached (91.89%), which is a high percentage indicating the validity of questionnaire, after making the modifications approved by the jury members, which included an amendment to the formulation of some questionnaire items. The researchers made the modifications referred to by the jury members, and thus the final questionnaire became consist (5) dimensions of Competencies, after making the modifications approved by the jury members.

### **3. Internal consistency validity**

The internal consistency was calculated by applying questionnaire to the pilot sample those consisted of (28) individuals from outside main sample as follows:

- 1) Calculation of correlation coefficients among questionnaire items and total score of questionnaire dimensions each dimension separately:**



**Table 9: Correlation coefficients between questionnaire items and questionnaire**

Technological Competencies		Professional Competencies		Performance Competencies		Teaching Experiences		Environmental and Community Work Experiences	
Items	Correlation Coefficient of questionnaire items and questionnaire dimensions	Items	Correlation Coefficient of questionnaire items and questionnaire dimensions	Items	Correlation Coefficient of questionnaire items and questionnaire dimensions	Items	Correlation Coefficient of questionnaire items and questionnaire dimensions	Items	Correlation Coefficient of questionnaire items and questionnaire dimensions
1	0.828*	1	0.895*	1	0.800*	1	0.890*	1	0.830*
2	0.826*	2	0.820*	2	0.815*	2	0.891*	2	0.740*
3	0.891*	3	0.870*	3	0.729*	3	0.777*	3	0.730*
4	0.866*	4	0.793*	4	0.806*	4	0.801*	4	0.826*
5	0.894*	5	0.729*	5	0.829*	5	0.892*	5	0.847*
6	0.812*	6	0.810*	6	0.850*	6	0.735*	6	0.870*
7	0.831*	7	0.775*	7	0.753*	7	0.740*	7	0.848*
8	0.809*			8	0.822*	8	0.812*		
						9	0.800*		
						10	0.870*		
						11	0.881*		
						12	0.740*		
						13	0.729*		
						14	0.813*		
						15	0.826*		
						16	0.807*		

\* Correlation is significant at the level (0.05)

The table (9) shows the correlation coefficients between questionnaire items and questionnaire dimensions each dimension separately have ranged between (0.729) and (0.895), all of which are a statistical significant at the level of (0.05).

**2) Calculation of correlation coefficients between total score of questionnaire dimensions and overall score of questionnaire:**

**Table 10: Correlation coefficients between total score for each questionnaire**

Questionnaire Dimensions	Correlation Coefficients
First: The Technological Competencies	0.914*
Second: The professional competencies	0.833*
Third: Performance Competencies	0.944*
Fourth: The Teaching Experiences	0.572*
Fifth: The Environmental and Community Work Experiences	0.717*

\* Correlation is significant at the at level (0.05)

The table (10) shows the correlation coefficients between overall score of questionnaire and total score for each dimension which ranged between (0.572) and (0.944), all of which are a statistical significant at the level of (0.05).

It is clear from previous tables (9) (10) that the coefficients of correlations between the items and the total degree for each dimension separately, as well as between the total score for each dimension and the total score of questionnaire are all statistically significant at the level of (0.05); this indicates the correlation and coherence of the items, dimensions and questionnaire as a whole, which indicates that questionnaire. It has internal consistency.

### ***The questionnaire's Reliability***

Reliability of questionnaire was calculated in a number of ways, Cronbach's Alpha, and Split-Half, as follows:

- A. Cronbach's Alpha:** researchers used this method to calculate the reliability of the test by applying it to a sample of (28) male and female from Trainers in Applied Technology Schools (ATS). The following table (11) shows reliability coefficients for each dimension of questionnaire as well as total score using Alpha coefficient. Cronbach's Alpha coefficients for value of Cronbach's Alpha for whole questionnaire were (0.903).

**Table 11: Results of the reliability coefficient values by Cronbach's Alpha**

Questionnaire Dimensions	Number of items	Cronbach's Alpha Coefficient
First: The Technological Competencies	8	0.830
Second: The professional competencies	7	0.808
Third: Performance Competencies	8	0.819
Fourth: The Teaching Experiences	16	0.844
Fifth: The Environmental and Community Work Experiences	7	0.826
<b>Questionnaire as Whole</b>	<b>46</b>	<b>0.903</b>

These values indicate that the questionnaire enjoys an appropriate level of reliability for determining the necessary professional competencies of teachers in applied technology schools.

- B. Split-Half:** The questionnaire's reliability coefficient was calculated using the split-half method. The pilot sample responses were first separated into two halves, and then the scores of the entire questionnaire were divided accordingly. Pearson correlation coefficients were then calculated between the scores of the two halves. These correlations were subsequently adjusted using the Spearman-Brown formula, as shown in Table (12).

**Table 12: Results of reliability coefficient values by Split-Half**

Questionnaire	Number of Items	Correlation between Forms (Pearson)	Reliability Coefficient after Correction (Spearman-Brown)
Questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the trainers' point of view	46	0.823	0.961

These values indicate that the questionnaire possesses an appropriate level of reliability to determining the necessary professional competencies of teachers in applied technology schools. Consequently, the overall questionnaire reliability is confirmed. It is evident from the table (12) that the values are suitable, trustworthy, and indicate the validity of the questionnaire for application.

## **Psychometric Properties for Interview Form with School Leaders about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS)**

When assessing the psychometric properties of an interview form designed to gather information from school leaders about the necessary professional competencies for teachers in Applied Technology Schools (ATS), several key aspects should be considered.

These properties help ensure the validity and reliability of the instrument and the accuracy of the data collected. Here are some important psychometric properties to consider:

### ***Interview Form's Validity***

The validity of Interview Form with School Leaders about the Necessary Professional Competencies for Teachers of Applied Technology Schools has been verified through the following:

1. **Content Validity:** Ensure that the questions in the interview form adequately cover the relevant aspects of professional competencies required for teachers in ATS. Expert review and alignment with established competency frameworks can help assess content validity (Zohrabi, 2013, 254).

The credibility of this Interview Form was enhanced through The credibility of the judges was applied, meaning that what others said was consistent with what was described or interpreted by the researchers. This matter requires presenting the researchers' findings and interpretations to an expert specialist in curriculum & teaching methods, and comparative education. The results were presented to two experts in the field for their agreement with the researchers' results and interpretations.

The percentage of agreement between researchers and experts reached (90.52%), which is a high percentage indicating the validity of the content of the interview questionnaire in determining the professional competencies required for teachers of applied technology schools.

2. **Construct Validity:** This property evaluates whether the interview form effectively measures the underlying constructs it intends to assess.

The credibility of this Interview Form was enhanced through Teacher Competencies Matrix, this matrix which depend on the analysis of the competencies that were explored in the international models of ILO, Finnish and German systems, competencies are clustered into categories, subcategories, and competencies. Hence, for the purpose of the survey design, competencies were grouped and clustered based on their type to guide the formulation of

The relevant sets of competencies. Matrix has been concluded for the design of the survey tools drawing on the Finnish and German TVET teacher competencies and that is presented in previous chapter.

### ***Interview Form's Reliability***

The Reliability of Interview Form with School Leaders about the Necessary Professional Competencies for Teachers of Applied Technology Schools has been verified through the following:

1. **Inter-rater reliability:** If multiple interviewers are involved, inter-rater reliability examines the consistency of ratings given by different interviewers to ensure that the form produces consistent results across different raters (Ishtiaq,2019,40).

This has been verified through the participation of multiple researchers in the work team; the results were stable and consistent across different participants and at different times, indicating the reliability of the data, the percentage of Reliability reached (91.04%).

- 2. Test-Retest Reliability:** If the interview form is administered on two different occasions to the same respondents, test-retest reliability checks whether the responses are consistent over time (Lazaraton, 2005, 213-214).

The Reliability of the interview form was verified in this way by re-meeting with the school leaders again, as the first time was in the ministry, and the second time was inside their schools.

The percentage of Reliability between the results of the two meetings was (92.00%), which is high, indicating high Reliability, and indicates the validity of applying the interview form to determine the professional competencies required for teachers of applied technology schools.

### ***Interview Form's Objectivity Measurement***

The Objectivity Measurement of Interview Form with School Leaders about the Necessary Professional Competencies for Teachers of Applied Technology Schools has been verified through the following:

- 1. Objectivity in analysis and interpretation:** It relates to the researcher's ability to analyze and interpret in a neutral and objective manner without entering his personal opinions or individual biases (Lazaraton, 2005, 221).

Exactly everything mentioned by the participants was recorded done through the field application team, and an attempt to mention the words of the participants as they were mentioned in their language for the sake of accuracy.

- 2. Clarity and transparency:** It includes presenting the results and information in a transparent and clear manner without concealing or distorting the data (Nassaji, 2020, 429).

This was verified in the interview form through this was evident by clarifying the work mechanism when interviewing the participants in the study.

The indications from these indicators imply that the Interview Form used to gather information from School Leaders regarding the required professional competencies for teachers in Applied Technology Schools possesses a favorable level of validity, reliability, and objectivity. As a result, it can be deemed trustworthy and demonstrates the suitability of the interview form for practical implementation.

### **Psychometric Properties for Interview Form with Companies about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS)**

When assessing the psychometric properties of an interview form designed to gather information from Industrial partner about the necessary professional competencies for teachers in Applied Technology Schools (ATS), several key aspects should be considered.

These properties help ensure the validity and reliability of the instrument and the accuracy of the data collected. Here are some important psychometric properties to consider:

### ***Interview Form's Validity***

The validity of Interview Form with Industrial partner about the Necessary Professional Competencies for Teachers of Applied Technology Schools has been verified through the following:

#### **1. Content Validity:**

The Interview Form's credibility was strengthened by ensuring that the judges' credibility was taken into account. This involved confirming that the opinions expressed by others aligned with the researchers' descriptions and interpretations. To ensure accuracy, the researchers shared their findings and interpretations with a specialized expert in curriculum and teaching methods, as well as comparative education. The results were then presented to two field experts to gauge their alignment with the researchers' conclusions.

The agreement percentage between the researchers and the experts reached an impressive (93.00%), signifying a high level of validity for the interview form in identifying the essential professional competencies required for teachers in applied technology schools.

#### **2. Construct Validity :**

The interview form's credibility was strengthened by utilizing the Teacher Competencies Matrix, which is based on an analysis of competencies from various international models such as ILO, Finnish, and German systems. These competencies were organized into categories, subcategories, and specific skills, as explained in the previous chapter.

### ***Interview Form's Reliability***

The Reliability of Interview Form with Industrial partner about the Necessary Professional Competencies for Teachers of Applied Technology Schools has been verified through the following:

#### **1. Inter-rater Reliability:**

The Reliability verification process involved the involvement of multiple researchers in the project team, ensuring that the results remained stable and consistent among various participants and at different points in time. This consistency indicated the reliability of the data, and the level of reliability achieved was (89.55%).

#### **2. Test-Retest Reliability:**

The Reliability of the interview form was verified in this way by re-meeting with the Industrial partner again, as the first time was in the ministry, and the second time was inside their schools.

The percentage of Reliability between the results of the two meetings was (90.17%), which is high, indicating high Reliability, and indicates the Reliability of applying the interview form to determine the professional competencies required for teachers of applied technology schools.

### ***Interview Form's Objectivity Measurement***

The Objectivity Measurement of Interview Form with Industrial partner about the Necessary Professional Competencies for Teachers of Applied Technology Schools has been verified through the following:

#### **1. Objectivity in analysis and interpretation:**

Every detail shared by the participants during the field application was meticulously recorded by the team. Moreover, the team made an effort to capture the participants' exact words in their own language to ensure utmost accuracy.

## **2. Clarity and transparency:**

This was verified in the interview form through this was evident by clarifying the work mechanism when interviewing the participants in the study.

The indications from these indicators imply that the Interview Form used to gather information from companies regarding the required professional competencies for teachers in Applied Technology Schools possesses a favorable level of validity, reliability, and objectivity. As a result, it can be deemed trustworthy and demonstrates the suitability of the interview form for practical implementation.

### **Psychometric Properties for Interview Form with Parents about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS)**

When assessing the psychometric properties of an interview form designed to gather information from Parents of School Students about the necessary professional competencies for teachers in Applied Technology Schools (ATS), several key aspects should be considered.

These properties help ensure the validity and reliability of the instrument and the accuracy of the data collected. Here are some important psychometric properties to consider:

#### ***Interview Form's Validity***

The validity of Interview Form with Parents about the Necessary Professional Competencies for Teachers of Applied Technology Schools has been verified through the following:

##### **1. Content Validity :**

The Interview Form's credibility was strengthened by ensuring that the judges' credibility was taken into account. This involved confirming that the opinions expressed by others aligned with the researchers' descriptions and interpretations. To ensure accuracy, the researchers shared their findings and interpretations with a specialized expert in curriculum and teaching methods, as well as comparative education. The results were then presented to two field experts to gauge their alignment with the researchers' conclusions.

The agreement percentage between the researchers and the experts reached an impressive (91.23%), signifying a high level of validity for the interview form in identifying the essential professional competencies required for teachers in applied technology schools.

##### **2. Construct Validity :**

The interview form's credibility was strengthened by utilizing the Teacher Competencies Matrix, which is based on an analysis of competencies from various international models such as ILO, Finnish, and German systems. These competencies were organized into categories, subcategories, and specific skills, as explained in the previous chapter.

#### ***Interview Form's Reliability***

The Reliability of Interview Form with Parents about the Necessary Professional Competencies for Teachers of Applied Technology Schools has been verified through the following:

##### **Inter-rater Reliability:**

The Reliability verification process involved the involvement of multiple researchers in the project team, ensuring that the results remained stable and consistent among various participants and at different

points in time. This consistency indicated the reliability of the data, and the level of reliability achieved was (88.95%).

### ***Interview Form's Objectivity Measurement***

The Objectivity Measurement of Interview Form with Parents about the Necessary Professional Competencies for Teachers of Applied Technology Schools has been verified through the following:

#### **1. Objectivity in analysis and interpretation:**

Every detail shared by the participants during the field application was meticulously recorded by the team. Moreover, the team made an effort to capture the participants' exact words in their own language to ensure utmost accuracy.

#### **2. Clarity and transparency:**

This was verified in the interview form through this was evident by clarifying the work mechanism when interviewing the participants in the study.

The indications from these indicators imply that the Interview Form used to gather information from Parents regarding the required professional competencies for teachers in Applied Technology Schools possesses a favorable level of validity, reliability, and objectivity. As a result, it can be deemed trustworthy and demonstrates the suitability of the interview form for practical implementation.

#### **Statistical treatment methods**

The Social Sciences Statistical Package SPSS ver.25 was used to perform statistical analyzes, and the methods used in this research are:

- Cooper's equation to find agreement ratios among jurors.
- Cronbach's Alpha, and Split-Half to calculate reliability of measurement instruments.
- Pearson correlation coefficient to estimate internal consistency of measurement instruments.
- Statistical data processing: The 5-likert scale was used, through frequencies, percentages, and relative weights from the point of view of the study sample to reach descriptive data, and the estimates of the study sample were classified into five levels so that the relative weight is very high, between (4.21 to 5.00), from (3.41 to 4.20) it is high, and from (2.61 to 3.40) it is medium , and between (1.81 to 2.60) it is low, and from (1.00 to 1.80) it is very low.

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## **Chapter 3: Results and Discussion**

### **Introduction**

This Chapter focuses on data finding and analysis for the training needs assessment study that has been conducted for the Advanced Technology School within the Egyptian context. It includes the analysis of the results of the study tools (two questionnaires and three interview forms) conducted during the second semester of the academic year 2022-2023. These tools are as follows:

1. Questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view.
2. Questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Trainers' point of view.
3. Interview Form with School Leaders about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS).
4. Interview Form with companies about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS).
5. Interview Form with parents about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS).

Results of Questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view

This part of the results included a description of characteristics of study sample members, and also included a presentation of results through questionnaire's dimensions, each separately, as follows:

#### **Description of characteristics of main sample (Teachers)**

The following is a presentation and analysis of results related to demographic information of sample members in terms of Gender, Education, School, and Experience, as follows:

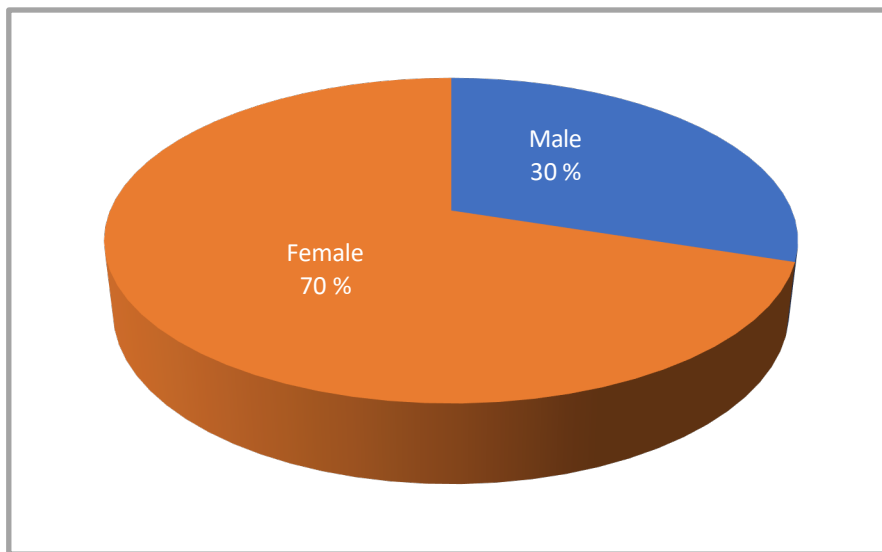
**Table 13: Description of main sample**

<b>Variables</b>	<b>Categories</b>	<b>Frequency</b>	<b>Percent</b>
<b>Gender</b>	Male	21	30.0%
	Female	49	70.0%
	<b>Total</b>	<b>70</b>	<b>100.0%</b>
<b>Education</b>	Bachelor's degree	51	72.9%
	Postgraduate studies (Diplomas)	11	15.7%
	Master	6	8.6%
	Doctor	2	2.9%
	<b>Total</b>	<b>70</b>	<b>100.0%</b>
<b>School</b>	Imam Mohamed Metwally Al-Shaarawy School for Applied Technology	30	42.9%
	Volkswagen School for Applied Technology	9	12.9%
	Electro Misr School for Applied Technology	13	18.6%
	Mechatronics School for Applied Technology	4	5.7%
	We School for Applied Technology	14	20.0%
	<b>Total</b>	<b>70</b>	<b>100.0%</b>
<b>Experience</b>	Less than 5 years old	26	37.1%
	From 5 to less than 10 years	15	21.4%
	From 10 to less than 15 years old	5	7.1%
	15 years and over	24	34.3%
	<b>Total</b>	<b>70</b>	<b>100.0%</b>

The results contained in the previous table (1) showed that sample included males participation rate of (30.0%), while females participation rate was (70.0%).

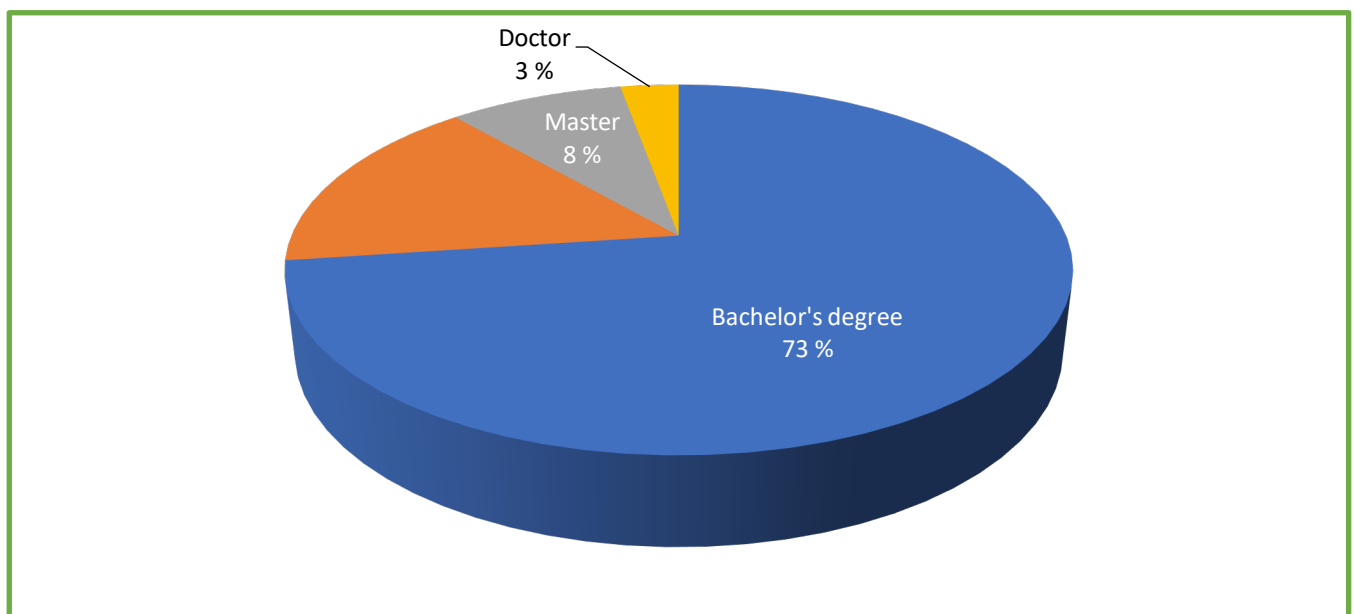
**These results can be illustrated by following figure (1):**

**Figure 1: The main study sample categories based on Gender**



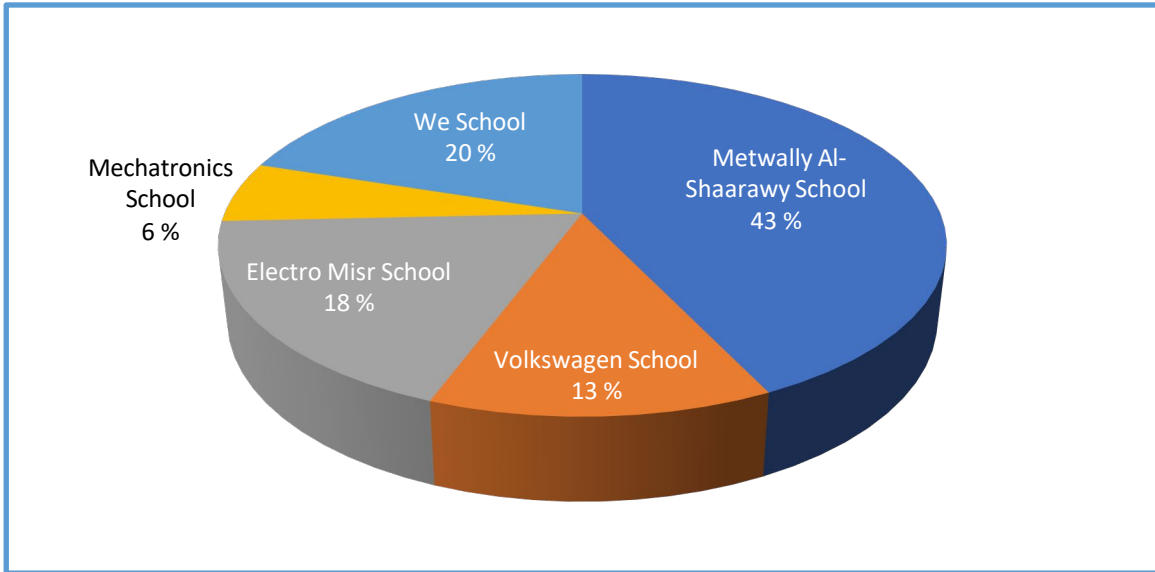
The sample also comprised teachers with different educational qualifications, Participants with a Bachelor's degree made up (72.9%) of the total sample, while those with Postgraduate studies (Diplomas) accounted for (15.7%). Additionally, (8.6%) held a Master's degree, and (2.9%) had completed their Doctorate.

**Figure 2: The main study sample categories based on level of education**



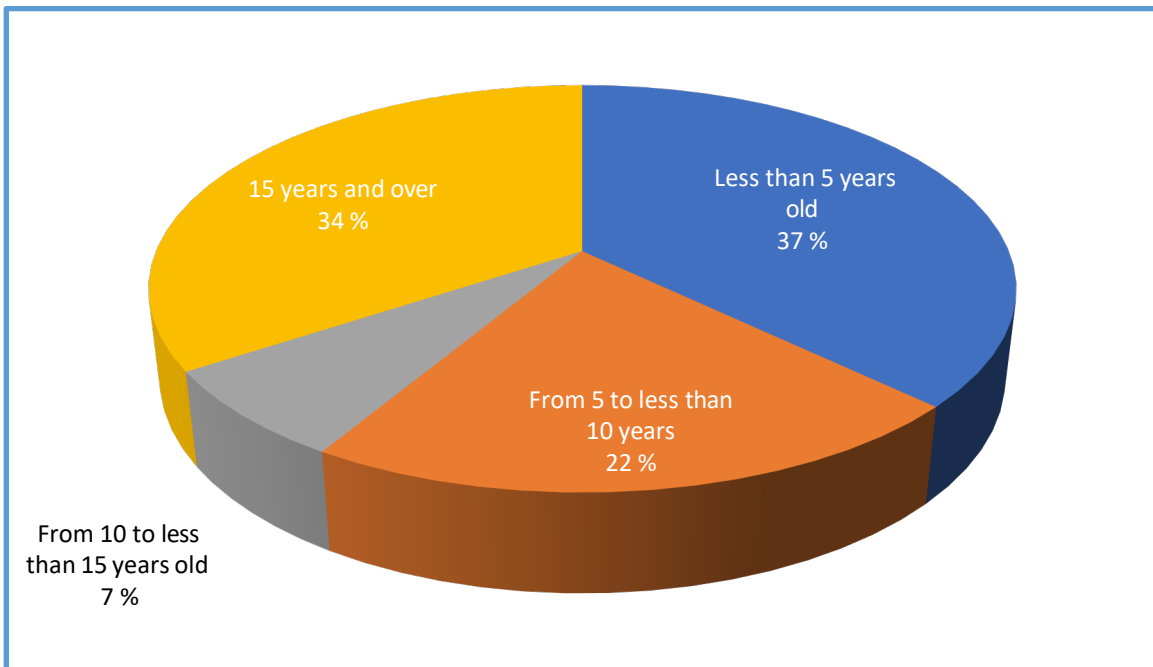
The results contained in the previous table (1) showed that sample included (70) teachers from five schools: Imam Mohamed Metwally Al-Shaarawy School for Applied Technology with a participation rate of (42.9%), Volkswagen School for Applied Technology with a participation rate of (12.9%), Electro Misr School for Applied Technology with a participation rate of (18.6%), Mechatronics School for Applied Technology with a participation rate of (5.7%), We School for Applied Technology with a participation rate of (19.6).

**Figure 3: The main study sample categories based on school**



The sample included four groups based on years of experience, The first group had experience (less than 5 years) with percentage (37.1%) of the total sample, The second group had experience (From 5 to less than 10 years) with percentage (21.4%), The third group had experience (From 10 to less than 15 years old) with percentage (7.1%), Finally, the fourth group had experience (15 years and over) with percentage (34.3%).

**Figure 4: The main study sample categories based on years of experience**



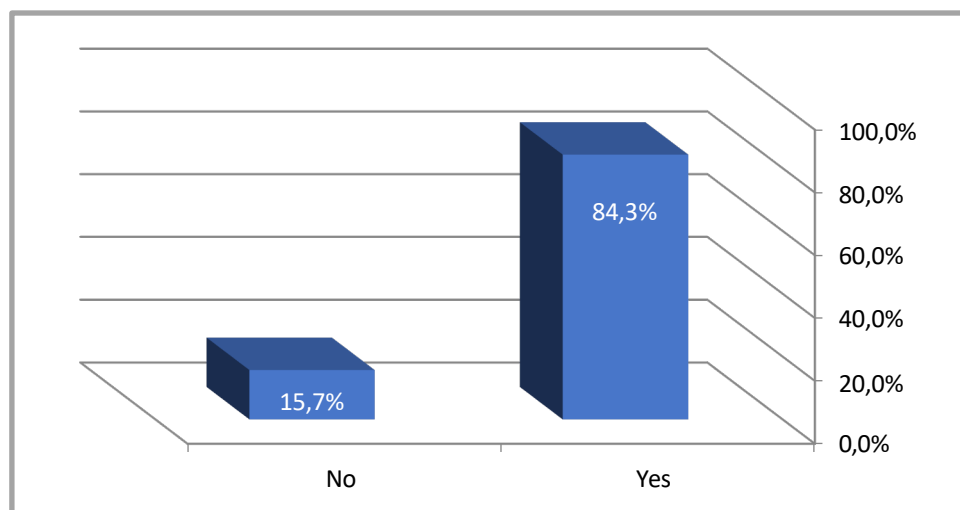
- **Question (1)**

**Table 14: Frequencies, Percentages, and Standard Deviations for Teachers' opinions regarding the first question (N = 70)**

Question	Responses	Frequency	percent	Standard Deviation
Have you received on the job training courses related to the development of your professional competence?	Yes	59	84.3%	0.367
	No	11	15.7%	

Results presented in previous table (2) showed that main sample from teachers responded to question: **“Have you received on the job training courses related to the development of your professional competence?”** responses were **“Yes”** at a rate of (84.3%), while the responses were **“No”** at a rate of (15.7%), The response to this question was standard deviation (0.367).

**Figure 5: Teachers' opinions regarding the first question**



- **Question (2)**

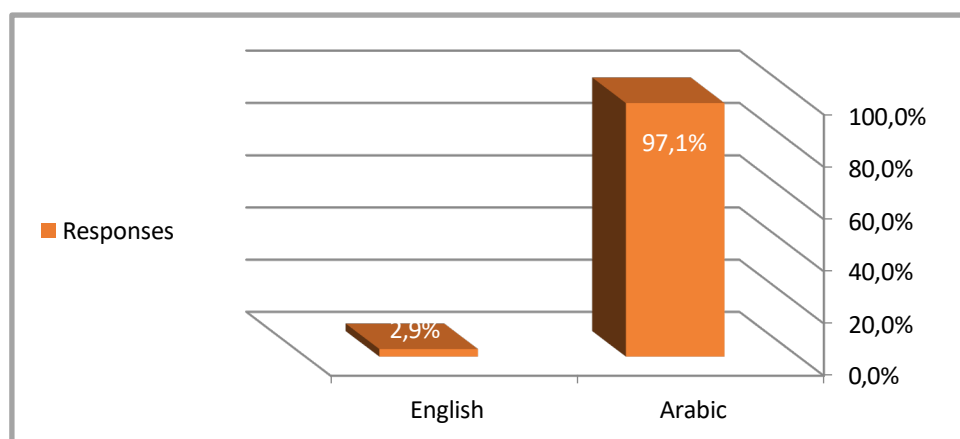
**Table 15: Frequencies, Percentages, and Standard Deviations for Teachers' opinions regarding the second question (N = 70)**

Question	Responses	Frequency	percent	Standard Deviation
What is your favorite training language?	Arabic	68	97.1%	0.168
	English	2	2.9%	

Results presented in previous table (3) showed that main sample from teachers responded to question: **“What is your favorite training language?”** responses were **“Arabic”** at a rate of (97.1%), while the responses were **“English”** at a rate of (2.9%), The response to this question was standard deviation (0.168).

These results can be illustrated in the following figure (6)

**Figure 6: Teachers' opinions regarding the second question**



**Presentation and discussion of results:**

The results are presented through dimensions of the questionnaire each dimension separately as follows:

**The fields of training needs necessary to develop professional competencies:**

The following presents the responses of the study sample of teachers regarding the training areas they need to enhance their professional competencies in each field individually. It also shows the frequencies, percentages, means, standard deviations, and relative importance of each training area.

**Table 16: Frequencies, Percentages, Averages, and Standard Deviations for Teachers' opinions**

Field of Training	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
	%	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
Developing behavioral skills (interpersonal skills)	N	5	0	16	18	31	4.00	1.155	80%	7	High
	%	7.1	0.0	22.9	25.7	44.3					
Interpretation of the curriculum structure	N	0	0	15	32	23	4.11	0.733	82%	3	High
	%	0.0	0.0	21.4	45.7	32.9					
Technology tools for learning	N	0	5	0	32	33	4.33	0.812	87%	1	Very High
	%	0.0	7.1	0.0	45.7	47.1					
Facilitate the learning process	N	0	0	12	24	34	4.31	0.753	86%	2	Very High
	%	0.0	0.0	17.1	34.3	48.6					

Field of Training	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
	%	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
Planning the learning process	N	0	5	10	29	26	4.09	0.897	82%	5	High
	%	0.0	7.1	14.3	41.4	37.1					
implementation of the learning process	N	0	5	7	33	25	4.11	0.860	82%	4	High
	%	0.0	7.1	10.0	47.1	35.7					
Evaluation of the learning process	N	0	5	12	27	26	4.06	0.915	81%	6	High
	%	0.0	7.1	17.1	38.6	37.1					
TOTAL	N	0	5	7	26	32	4.15	0.757	83%	High	
	%	0.0	7.1	10.0	37.1	45.7					

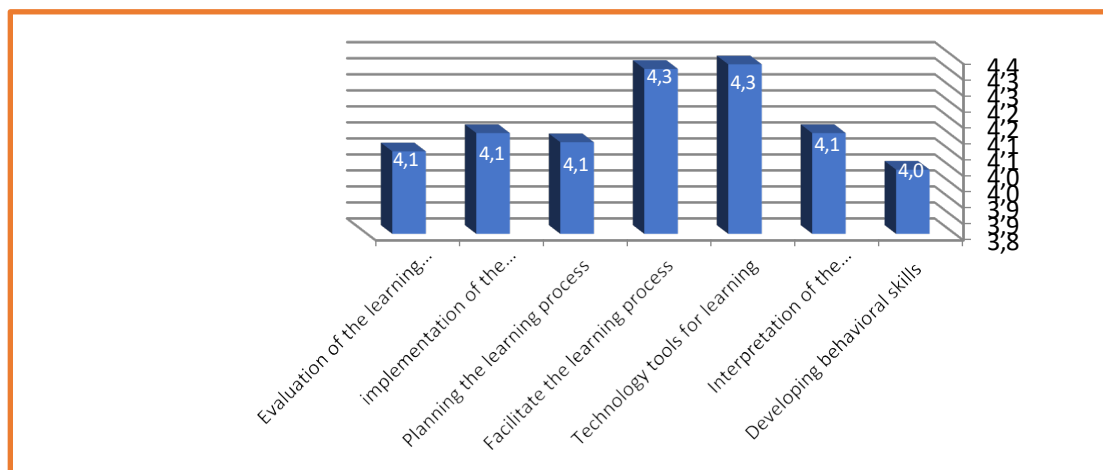
**It is clear from the statistical indicators for The field of training needs necessary to develop professional competencies in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view that:**

- ❖ The general average of total Fields of Training : it reached (4.15) with a standard deviation (0.757); This confirms the opinion of the questionnaire respondents (teachers of Applied Technology Schools) which high on level of need to train for developing professional competencies; This is because the weighted average of this total Fields of Training within scale category (3.41 to 4.20), which is considered about positive direction from point of view for questionnaire sample, And it reflects the teachers' need for training in those areas.
- ❖ In the first rank, the teachers (questionnaire sample) highest need for training was in the field of **Technology tools for learning**, The relative importance index of this filed reached (87%), reflecting the significant need for teachers to be trained in this field in order to develop professional competencies.
- ❖ In the second rank, the teachers (questionnaire sample) highest need for training was in the field of **Facilitate the learning process**, The relative importance index of this filed reached (86%), reflecting the significant need for teachers to be trained in this field in order to develop professional competencies.
- ❖ In the third rank, the teachers (questionnaire sample) highest need for training was in the field of **Interpretation of the curriculum structure**, The relative importance index of this filed reached (82%), reflecting the significant need for teachers to be trained in this field in order to develop professional competencies.
- ❖ In the fourth rank, the teachers (questionnaire sample) highest need for training was in the field of **implementation of the learning process**, The relative importance index of this filed reached (82%), reflecting the significant need for teachers to be trained in this field in order to develop professional competencies.
- ❖ In the fifth rank, the teachers (questionnaire sample) highest need for training was in the field of **Planning the learning process**, The relative importance index of this filed reached (82%), reflecting the significant need for teachers to be trained in this field in order to develop professional competencies.

- ❖ In the sixth rank, the teachers (questionnaire sample) highest need for training was in the field of **Evaluation of the learning process**, The relative importance index of this field reached (82%), reflecting the significant need for teachers to be trained in this field in order to develop professional competencies.
- ❖ In the seventh and final rank, the teachers (questionnaire sample) highest need for training was in the field of **Developing behavioral skills (interpersonal skills)**, The relative importance index of this field reached (80%), reflecting the significant need for teachers to be trained in this field in order to develop professional competencies.

These results can be illustrated in the following figure (7)

**Figure 7: Teachers' opinions about The fields of training needs necessary**



#### First: The Cognitive Competencies

The following presents the responses of the study sample of teachers regarding the Cognitive Competencies. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

**Table 17: Frequencies, Percentages, Averages, and Standard Deviations for Teachers' opinions**

S	Cognitive Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			%	Strongly Disagree	Disagree	Neutral	Agree					
1	Methods of motivating students to learn.	N	0	0	11	24	35	4.34	0.740	87%	3	Very High
		%	0.0	0.0	15.7	34.3	50.0					
2	Design programs and activities that develop different types of thinking for students.	N	0	0	10	23	37	4.39	0.728	88%	2	Very High
		%	0.0	0.0	14.3	32.9	52.9					
3		N	0	0	16	21	33	4.24	0.806	85%	6	



S	Cognitive Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need	
			%	Strongly Disagree	Disagree	Neutral	Agree						Strongly Agree
	Taking care of outstanding students and taking into account individual differences.		%	0.0	0.0	22.9	30.0	47.1					Very High
4	How to identify students' weaknesses in preparation for their treatment.	N	0	5	7	28	30	4.19	0.889	84%	7	High	
		%	0.0	7.1	10.0	40.0	42.9						
5	Producing teaching aids appropriate to the subject matter.	N	0	0	5	27	38	4.47	0.631	89%	1	Very High	
		%	0.0	0.0	7.1	38.6	54.3						
6	Activating classroom and extra-curricular activities.	N	0	5	5	27	33	4.26	0.879	85%	4	Very High	
		%	0.0	7.1	7.1	38.6	47.1						
7	Dealing with machines and devices in the Learning Resource Center.	N	0	0	17	19	34	4.24	0.824	85%	5	Very High	
		%	0.0	0.0	24.3	27.1	48.6						
8	Preparing educational bags and electronic courses.	N	0	0	8	49	13	4.07	0.547	81%	9	High	
		%	0.0	0.0	11.4	70.0	18.6						
9	Methods of linking the curriculum with life problems.	N	0	0	20	24	26	4.09	0.812	82%	8	High	
		%	0.0	0.0	28.6	34.3	37.1						
<b>TOTAL</b>		N	0	0	10	21	39	4.25	0.625	85%	Very High		
		%	0.0	0.0	14.3	30.0	55.7						

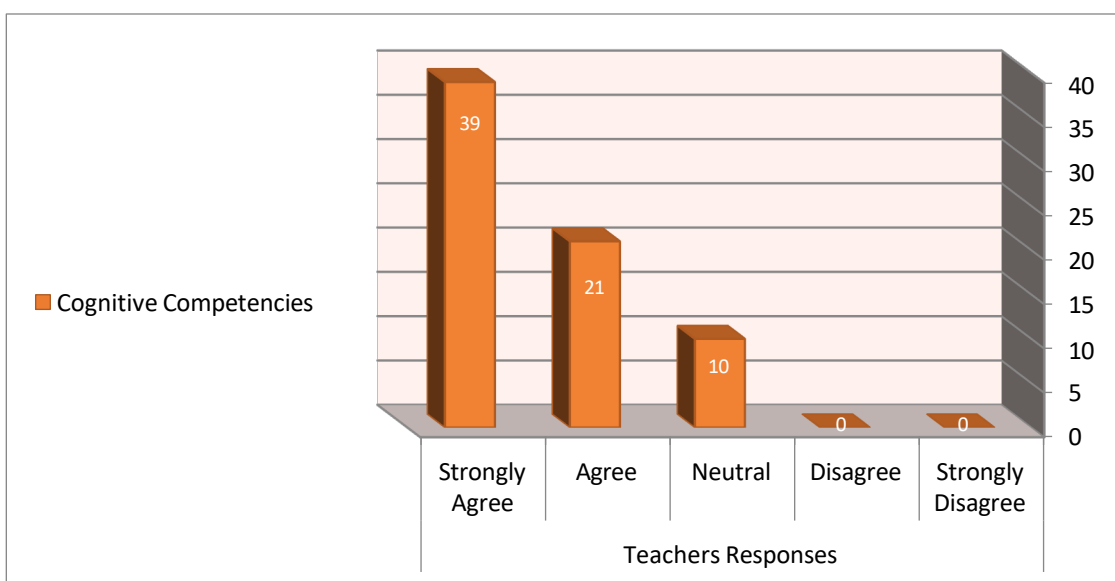
**It is clear from the statistical indicators for The Cognitive Competencies in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view that:**

- ❖ The general average of total Cognitive Competencies: it reached (4.25) with a standard deviation (0.625); This confirms the opinion of the questionnaire respondents (teachers of Applied Technology Schools) they need those competencies to very high degree; This is because the weighted average of this total Cognitive Competencies within scale category (4.21 to 5.00), which is considered about positive direction from point of view for questionnaire sample, And it reflects the teachers' need for training in the Cognitive Competencies.

- ❖ In the first rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Producing teaching aids appropriate to the subject matter**, The relative importance index of this Competency reached (89%), reflecting the urgent need for teachers to be trained in those competency within the cognitive competencies.
- ❖ In the second rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Design programs and activities that develop different types of thinking for students**, The relative importance index of this Competency reached (88%), reflecting the urgent need for teachers to be trained in those competency within the cognitive competencies.
- ❖ In the third rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Methods of motivating students to learn**, The relative importance index of this Competency reached (87%), reflecting the urgent need for teachers to be trained in those competency within the cognitive competencies.
- ❖ In the fourth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Activating classroom and extra-curricular activities**, The relative importance index of this Competency reached (85%), reflecting the urgent need for teachers to be trained in those competency within the cognitive competencies.
- ❖ In the fifth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Dealing with machines and devices in the Learning Resource Center**, The relative importance index of this Competency reached (85%), reflecting the urgent need for teachers to be trained in those competency within the cognitive competencies.
- ❖ In the sixth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Taking care of outstanding students and taking into account individual differences**, The relative importance index of this Competency reached (85%), reflecting the urgent need for teachers to be trained in those competency within the cognitive competencies.
- ❖ In the seventh rank, the teachers' (questionnaire sample) highest need for training on the Competency of **identify students' weaknesses in preparation for their treatment**, The relative importance index of this Competency reached (84%), reflecting the great need for teachers to be trained in those competency within the cognitive competencies.
- ❖ In the eighth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **linking the curriculum with life problems**, The relative importance index of this Competency reached (82%), reflecting the great need for teachers to be trained in those competency within the cognitive competencies.
- ❖ In the ninth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Preparing educational bags and electronic courses**, The relative importance index of this Competency reached (81%), reflecting the great need for teachers to be trained in those competency within the cognitive competencies.

These results can be illustrated in the following figure (8)

**Figure 8: Teachers' responses of needs training about cognitive competencies as a whole**



**Second: The Teaching Competencies**

The following presents the responses of the study sample of teachers regarding the Teaching Competencies. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

**Table 18: Frequencies, Percentages, Averages, and Standard Deviations for Teachers' opinions**

S	Teaching Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
1	Modern teaching strategies, cooperative learning and active learning.	N	0	5	10	24	31	4.16	0.927	83%	4	High
		%	0.0	7.1	14.3	34.3	44.3					
2	Face-to-face workshops.	N	0	5	7	22	36	4.27	0.916	85%	3	Very High
		%	0.0	7.1	10.0	31.4	51.4					
3	Laboratory work.	N	0	5	15	38	12	3.81	0.804	76%	10	High
		%	0.0	7.1	21.4	54.3	17.1					
4	Methods of diversification of teaching.	N	0	5	13	23	29	4.09	0.944	82%	7	High
		%	0.0	7.1	18.6	32.9	41.4					

S	Teaching Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
5	Employing modern technology in teaching.	N	0	0	8	27	35	4.39	0.687	88%	1	Very High
		%	0.0	0.0	11.4	38.6	50.0					
6	Teaching online (Teaching on the Internet).	N	0	2	13	28	27	4.14	0.822	83%	5	High
		%	0.0	2.9	18.6	40.0	38.6					
7	Develop students' innovative and creative thinking skills.	N	0	0	20	11	39	4.27	0.883	85%	2	Very High
		%	0.0	0.0	28.6	15.7	55.7					
8	Class and time management skills.	N	0	5	18	18	29	4.01	0.985	80%	9	High
		%	0.0	7.1	25.7	25.7	41.4					
9	Communication and communication skills with students.	N	0	0	19	24	27	4.11	0.808	82%	6	High
		%	0.0	0.0	27.1	34.3	38.6					
10	Skills to work under pressure.	N	0	1	25	16	28	4.01	0.909	80%	8	High
		%	0.0	1.4	35.7	22.9	40.0					
TOTAL		N	0	0	18	16	36	4.13	0.746	83%	High	
		%	0.0	0.0	25.7	22.9	51.4					

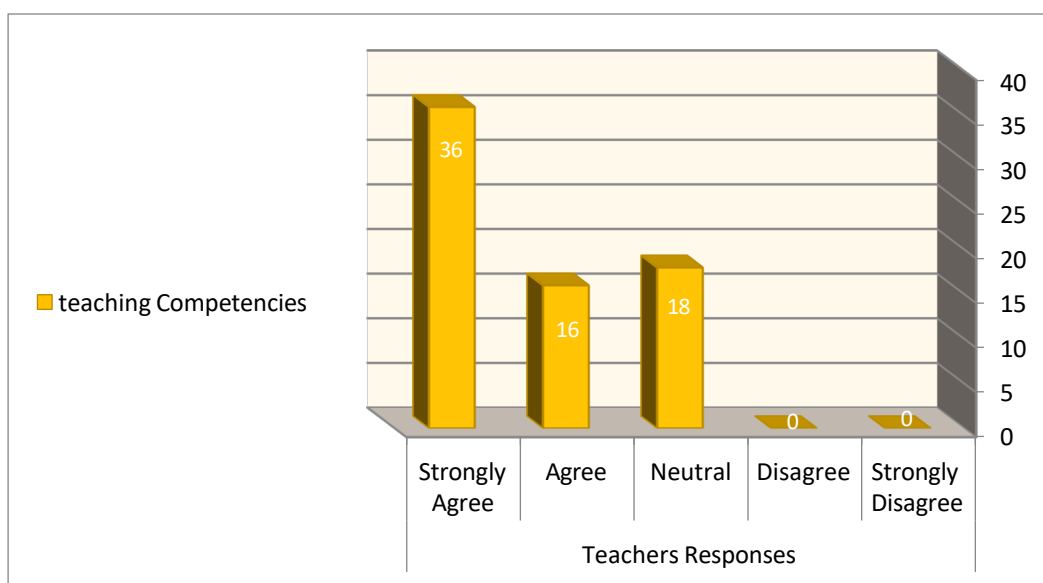
It is clear from the statistical indicators for The Teaching Competencies in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view that:

- ❖ The general average of total Teaching Competencies: it reached (4.13) with a standard deviation (0.746); This confirms the opinion of the questionnaire respondents (teachers of Applied Technology Schools) they need those competencies to high degree; This is because the weighted average of this total Teaching Competencies within scale category (3.41 to 4.20), which is considered about positive direction from point of view for questionnaire sample, And it reflects the teachers' need for training in the Teaching Competencies.
- ❖ In the first rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Employing modern technology in teaching**, the relative importance index of this Competency reached (88%), reflecting the urgent need for teachers to be trained in those competency within the Teaching competencies.

- ❖ In the second rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Develop students' innovative and creative thinking skills**, The relative importance index of this Competency reached (85%), reflecting the urgent need for teachers to be trained in those competency within the Teaching competencies.
- ❖ In the third rank, the teachers' (questionnaire sample) highest need for training on the Competency of **face-to-face workshops**, the relative importance index of this Competency reached (85%), reflecting the urgent need for teachers to be trained in those competency within the Teaching competencies.
- ❖ In the fourth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **modern teaching strategies, cooperative learning and active learning**, the relative importance index of this Competency reached (83%), reflecting the great need for teachers to be trained in those competency within the Teaching competencies.
- ❖ In the fifth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Teaching online (Teaching on the Internet)**, The relative importance index of this Competency reached (83%), reflecting the urgent need for teachers to be trained in those competency within the Teaching competencies.
- ❖ In the sixth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Communication and communication skills with students**, the relative importance index of this Competency reached (82%), reflecting the great need for teachers to be trained in those competency within the Teaching competencies.
- ❖ In the seventh rank, the teachers' (questionnaire sample) highest need for training on the Competency of **diversification of teaching**, the relative importance index of this Competency reached (82%), reflecting the great need for teachers to be trained in those competency within the Teaching competencies.
- ❖ In the eighth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **work under pressure**, the relative importance index of this Competency reached (80%), reflecting the greet need for teachers to be trained in those competency within the Teaching competencies.
- ❖ In the ninth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Class and time management**, the relative importance index of this Competency reached (80%), reflecting the great need for teachers to be trained in those competency within the Teaching competencies.
- ❖ In the tenth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **laboratory work**, the relative importance index of this Competency reached (76%), reflecting the greet need for teachers to be trained in those competency within the Teaching competencies.

These results can be illustrated in the following figure (9)

**Figure 9: Teachers' responses of needs training about teaching competencies as a whole**



**Third: The Assessment Competencies**

The following presents the responses of the study sample of teachers regarding the Assessment Competencies. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

**Table 19: Frequencies, Percentages, Averages, and Standard Deviations for Teachers' opinions**

S	Teaching Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
1	Self-evaluation to find out the effectiveness of the teaching methods used.	N	0	0	18	20	32	4.20	0.827	84%	2	High
		%	0.0	0.0	25.7	28.6	45.7					
2	Designing multiple tools for student evaluation (oral, written, essay, objective).	N	0	0	19	26	25	4.09	0.794	82%	4	High
		%	0.0	0.0	27.1	37.1	35.7					
3	How to use electronic tests in evaluation.	N	0	2	18	25	25	4.04	0.859	81%	5	High
		%	0.0	2.9	25.7	35.7	35.7					
4	Employing achievement files in following up students' performance.	N	0	0	8	36	26	4.26	0.652	85%	1	Very High
		%	0.0	0.0	11.4	51.4	37.1					
5		N	0	0	19	23	28	4.13	0.815	83%	3	High

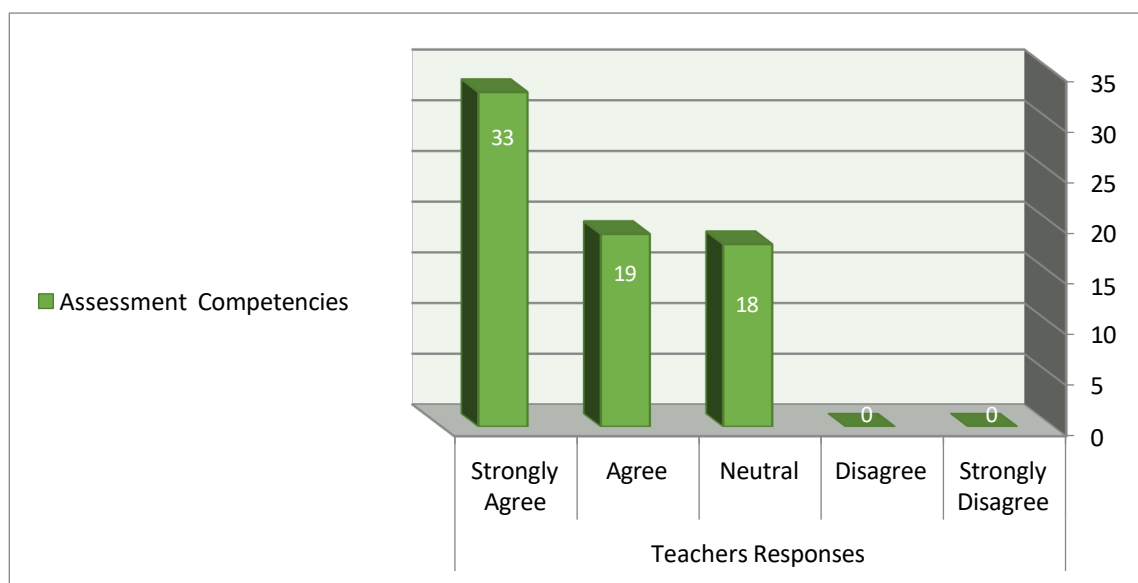
S	Teaching Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			%	Strongly Disagree	Disagree	Neutral	Agree					
	The optimal use of reward and punishment methods.	%	0.0	0.0	27.1	32.9	40.0					
TOTAL		N	0	0	18	19	33	4.14	0.686	83%	High	
		%	0.0	0.0	25.7	27.1	47.1					

It is clear from the statistical indicators for The Assessment Competencies in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view that:

- ❖ The general average of total Assessment Competencies: it reached (4.14) with a standard deviation (0.686); This confirms the opinion of the questionnaire respondents (teachers of Applied Technology Schools) they need those competencies to high degree; This is because the weighted average of this total Assessment Competencies within scale category (3.41 to 4.20), which is considered about positive direction from point of view for questionnaire sample, And it reflects the teachers' need for training in the Assessment Competencies.
- ❖ In the first rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Employing achievement files in following up students' performance**, The relative importance index of this Competency reached (85%), reflecting the urgent need for teachers to be trained in those competency within the Assessment competencies.
- ❖ In the second rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Self-evaluation to find out the effectiveness of the teaching methods used**, The relative importance index of this Competency reached (84%), reflecting the great need for teachers to be trained in those competency within the Assessment competencies.
- ❖ In the third rank, the teachers' (questionnaire sample) highest need for training on the Competency of **The optimal use of reward and punishment methods**, The relative importance index of this Competency reached (83%), reflecting the great need for teachers to be trained in those competency within the Assessment competencies.
- ❖ In the fourth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Designing multiple tools for student evaluation (oral, written, essay, objective)**, The relative importance index of this Competency reached (82%), reflecting the great need for teachers to be trained in those competency within the Assessment competencies.
- ❖ In the fifth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **using electronic tests in evaluation**, The relative importance index of this Competency reached (81%), reflecting the great need for teachers to be trained in those competency within the Assessment competencies.

These results can be illustrated in the following figure (10)

**Figure 10: Teachers' responses of needs training about Assessment Competencies as a whole**



#### Fourth: Competencies related to Vocational and Technical Training and Education

The following presents the responses of the study sample of teachers regarding Competencies related to Vocational and Technical Training and Education. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

**Table 20: Frequencies, Percentages, Averages, and Standard Deviations for Teachers' opinions**

S	Vocational and Technical Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
1	Applying the competency-based approach in teaching and evaluation.	N	0	0	15	27	28	4.19	0.767	84%	6	High
		%	0.0	0.0	21.4	38.6	40.0					
2	Work-based learning (in the training center/simulation/in-company workshops).	N	0	0	13	31	26	4.19	0.728	84%	5	High
		%	0.0	0.0	18.6	44.3	37.1					
3	Developing students' skills in (design thinking, critical thinking, communication, initiative...).	N	0	0	13	24	33	4.29	0.764	86%	3	Very High
		%	0.0	0.0	18.6	34.3	47.1					
4		N	0	0	13	33	24	4.16	0.715	83%	7	High



S	Vocational and Technical Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			%	Strongly Disagree	Disagree	Neutral	Agree					
	Developing students' skills in (design thinking, critical thinking, communication, initiative...).		%	0.0	0.0	18.6	47.1	34.3				
5	How to teach specific technical or digital skills.	N	0	0	18	27	25	4.10	0.783	82%	8	High
		%	0.0	0.0	25.7	38.6	35.7					
6	Create a website for teaching and training students using electronic content management software.	N	0	0	13	30	27	4.20	0.734	84%	4	High
		%	0.0	0.0	18.6	42.9	38.6					
7	Designing electronic educational units in the subject of specialization and publishing them through online content management programs.	N	0	0	7	31	32	4.36	0.660	87%	2	Very High
		%	0.0	0.0	10.0	44.3	45.7					
8	Cooperating with employers in factories and companies to ensure appropriate teaching and training.	N	0	0	6	29	35	4.41	0.648	88%	1	Very High
		%	0.0	0.0	8.6	41.4	50.0					
<b>TOTAL</b>		N	0	0	5	30	35	4.24	0.626	85%	Very High	
		%	0.0	0.0	7.1	42.9	50.0					

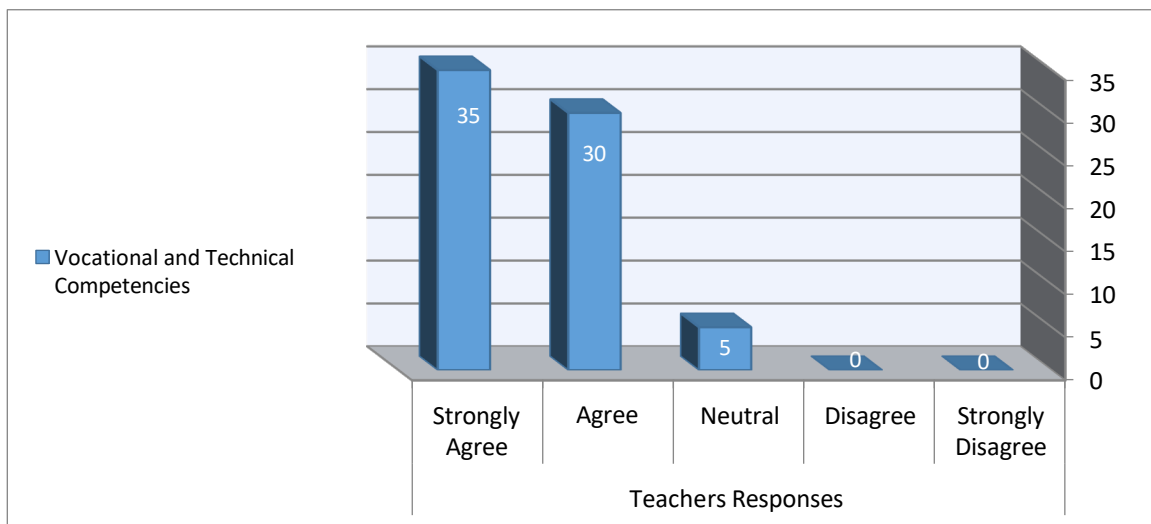
**It is clear from the statistical indicators for Vocational and Technical Competencies in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view that:**

- ❖ The general average of total Vocational and Technical Competencies: it reached (4.24) with a standard deviation (0.626); This confirms the opinion of the questionnaire respondents (teachers of Applied Technology Schools) they need those competencies to very high degree; This is because the weighted average of this total Vocational and Technical Competencies within scale category (4.21 to 5.00), which is considered about positive direction from point of view for questionnaire sample, And it reflects the teachers' need for training in the Vocational and Technical Competencies.
- ❖ In the first rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Cooperating with employers in factories and companies to ensure appropriate teaching and training**, The relative importance index of this Competency reached (88%), reflecting the urgent need for teachers to be trained in those competency within the Vocational and Technical competencies.

- ❖ In the second rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Designing electronic educational units in the subject of specialization and publishing them through online content management programs**, The relative importance index of this Competency reached (87%), reflecting the urgent need for teachers to be trained in those competency within the Vocational and Technical competencies.
- ❖ In the third rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Developing students' skills in (design thinking, critical thinking, communication, initiative...)**, The relative importance index of this Competency reached (86%), reflecting the urgent need for teachers to be trained in those competency within the Vocational and Technical competencies.
- ❖ In the fourth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Create a website for teaching and training students using electronic content management software**, The relative importance index of this Competency reached (84%), reflecting the urgent need for teachers to be trained in those competency within the Vocational and Technical competencies.
- ❖ In the fifth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Work-based learning (in the training center/simulation/in-company workshops)**, The relative importance index of this Competency reached (84%), reflecting the urgent need for teachers to be trained in those competency within the Vocational and Technical competencies.
- ❖ In the sixth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Applying the competency-based approach in teaching and evaluation**, The relative importance index of this Competency reached (84%), reflecting the urgent need for teachers to be trained in those competency within the Vocational and Technical competencies.
- ❖ In the seventh rank, the teachers' (questionnaire sample) highest need for training on the Competency of **Developing students' skills in (design thinking, critical thinking, communication, initiative...)**, The relative importance index of this Competency reached (83%), reflecting the urgent need for teachers to be trained in those competency within the Vocational and Technical competencies.
- ❖ In the eighth rank, the teachers' (questionnaire sample) highest need for training on the Competency of **How to teach specific technical or digital skills**, The relative importance index of this Competency reached (82%), reflecting the urgent need for teachers to be trained in those competency within the Vocational and Technical competencies.

These results can be illustrated in the following figure (11):

**Figure 11: Teachers' responses of needs training about Vocational and Technical Competencies as a whole**



### Pedagogical Competencies as a whole

The following presents the responses of the study sample of teachers regarding Competencies as a whole. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

**Table 21: Teachers' responses of needs training about Vocational and Technical Competencies as a whole**

No	Competencies	Weighted Average	Std. Deviation	Relative Importance Index	Ranking	Degree of Need
1	Cognitive Competencies	4.25	0.625	85%	1	Very High
2	Teaching Competencies	4.13	0.746	83%	4	High
3	Assessment Competencies	4.14	0.686	83%	3	High
4	Vocational and Technical Competencies	4.24	0.626	85%	2	Very High
<b>Weighted average of Questionnaire as a whole</b>		<b>4.19</b>	<b>0.650</b>	<b>84%</b>	<b>High</b>	

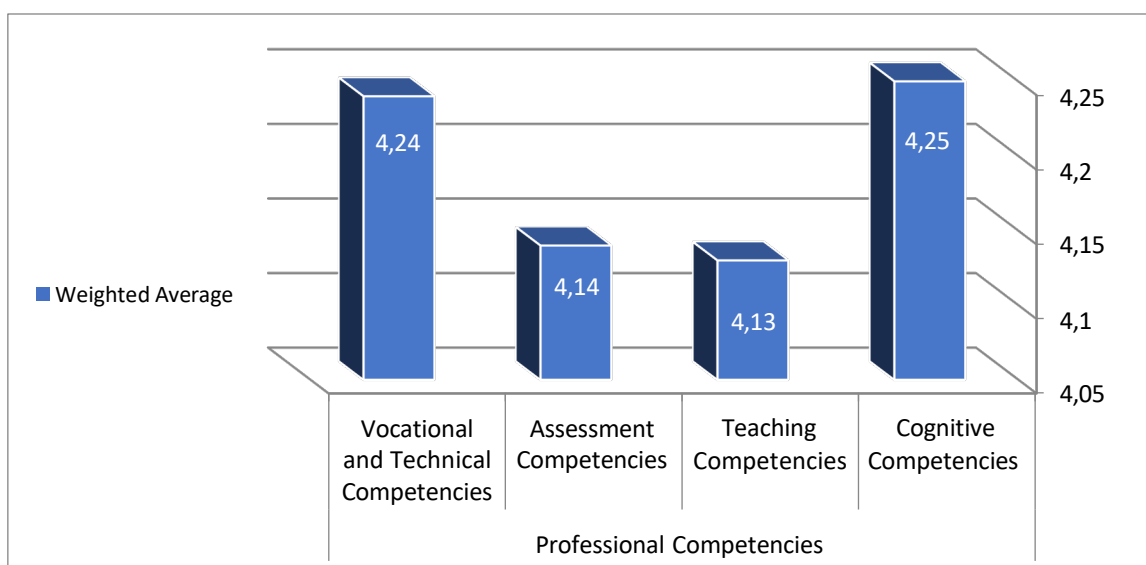
It is clear from statistical indicators of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Teachers' point of view questionnaire that:

The weighted average of questionnaire as a whole was (4.19) with a standard deviation of (0.650); It confirms the sample questionnaire's positive opinion on need developing of Professional Competencies for Teachers in Applied Technology Schools (ATS); This is because the weighted average of questionnaire within scale category (3.41 to 4.20), and The relative importance index of this questionnaire as a whole reached (84%), which is considered to be from direction of positivity from the point of view of the sample of questionnaire (Teachers in Applied Technology Schools).

- ❖ **First Rank:** the Cognitive Competencies got first rank, the relative importance index of this Competency reached (85%), which expresses urgent need for teachers to be trained in those competencies.
- ❖ **Second Rank:** the Vocational and Technical Competencies got second rank, the relative importance index of this Competency reached (85%), which expresses urgent need for teachers to be trained in those competencies.
- ❖ **Third Rank:** the Assessment Competencies got third rank, the relative importance index of this Competency reached (83%), which expresses great need for teachers to be trained in those competencies.
- ❖ **Fourth Rank:** the Teaching Competencies got fourth rank, the relative importance index of this Competency reached (83%), which expresses great need for teachers to be trained in those competencies.

These results can be illustrated by following figure (12)

**Figure 12: Necessary Professional Competencies for Teachers in Applied Technology Schools (ATS)**



**Open-Ended Questions :**

- ❖ When teachers of the Applied Technology Schools were asked about **describing the digital tools they use in their teaching**, they pointed out several of those tools, including educational platforms, online games, simulation programme, YouTube, Microsoft tools, Google Forms.
- ❖ One of them also mentioned using social media tools like WhatsApp, as well as video conferencing programme like Zoom.
- ❖ Another teacher mentioned the use of the internet, smart board; data show, and tablets.
- ❖ When asked about their **biggest challenges in teaching at the current moment**, the teachers mentioned various aspects. Some pointed out the rapid growth in their specialized field and the need to keep up with the pace of development.
- ❖ Another teacher mentioned the lack of interest from some students during explanations.
- ❖ One teacher expressed that their main challenge is the absence of internet availability and the lack of training on using educational technology and games.
- ❖ Meanwhile, one of the teachers emphasized that their greatest challenge is managing multiple classes simultaneously.
- ❖ When asked about their **teaching experiences, work environment, and the community**, one of the teachers mentioned that they greatly enjoy teaching at the Applied Technology Schools. he puts significant effort into preparing scientific material on a weekly basis, and the rewarding results make it all worthwhile.
- ❖ One of the female teachers noted that the work environment is excellent, with a strong sense of collaboration among the teachers, functioning as a unified team.
- ❖ Another teacher highlighted the importance of connecting the scientific material to the needs of the job market, considering it a crucial aspect of education and societal advancement.
- ❖ On the other hand, another teacher sees their role as a facilitator and a guide in the educational process, encouraging students to become seekers of knowledge rather than passive recipients.

- ❖ another teacher mentioned working on simplifying Arabic language material through diverse teaching methods.
- ❖ One of the teachers expressed a sense of belonging to the school due to the suitable working environment, despite facing some financial challenges.

**Overall, the teachers seem dedicated and motivated to provide a fruitful learning experience for their students in the context of the Applied Technology Schools.**

#### Results of Questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the Trainers' point of view

This part of the results included a description of characteristics of study sample members, and also included a presentation of results through questionnaire's dimensions, each separately, as follows:

##### **Description of characteristics of main sample (Trainers) :**

The following is a presentation and analysis of results related to demographic information of sample members in terms of Gender, Education, School, and Experience, as follows:

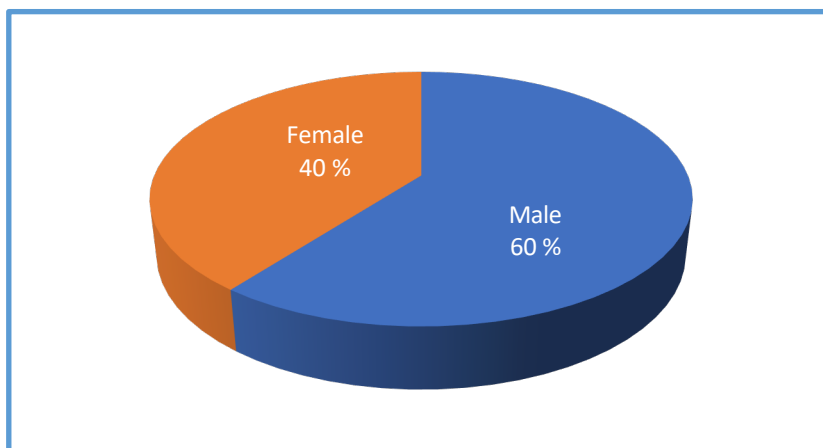
**Table 22: Description of main sample**

Variables	Categories	Frequency	Percent
<b>Gender</b>	Male	29	60.4%
	Female	19	39.6%
	<b>Total</b>	<b>48</b>	<b>100.0%</b>
<b>Education</b>	Bachelor's degree	38	79.2%
	Postgraduate studies (Diplomas)	4	8.3%
	Master	5	10.4%
	Doctor	1	2.1%
	<b>Total</b>	<b>48</b>	<b>100.0%</b>
<b>School</b>	Imam Mohamed Metwally Al-Shaarawy School for Applied Technology	15	31.3%
	Volkswagen School for Applied Technology	9	18.8%
	Electro Misr School for Applied Technology	9	18.8%
	Mechatronics School for Applied Technology	8	16.7%
	We School for Applied Technology	7	14.6%

Variables	Categories	Frequency	Percent
	<b>Total</b>	<b>48</b>	<b>100.0%</b>
<b>Experience</b>	Less than 5 years old	8	16.7%
	From 5 to less than 10 years	10	20.8%
	From 10 to less than 15 years old	3	6.3%
	15 years and over	27	56.3%
	<b>Total</b>	<b>48</b>	<b>100.0%</b>

The results contained in the previous table (10) showed that sample included males participation rate of (60.4%), while females participation rate was (39.6%).

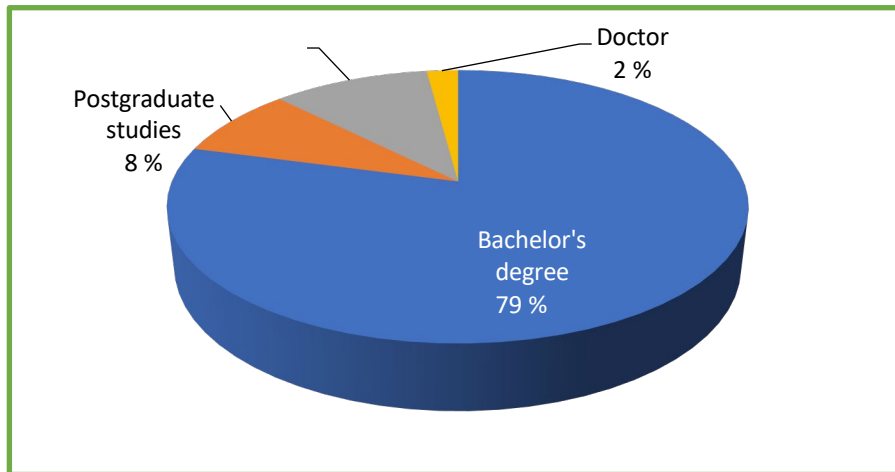
**These results can be illustrated by following figure (13):**



**Figure ( 13 )**  
**The main study sample categories based on Gender**

The sample also comprised trainers with different educational qualifications, Participants with a Bachelor's degree made up (79.2%) of the total sample, while those with Postgraduate studies (Diplomas) accounted for (8.3%). Additionally, (10.4%) held a Master's degree, and (2.1%) had completed their Doctorate.

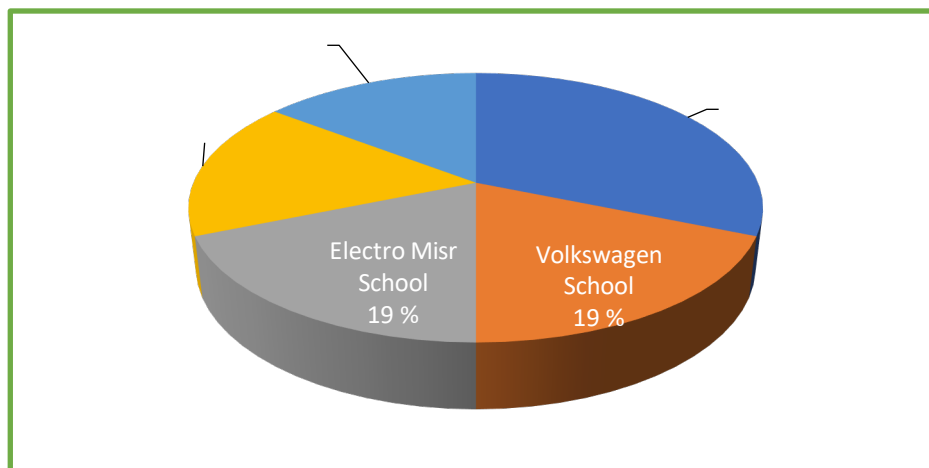
**These results can be illustrated by following figure (14):**



**Figure (14)**  
**The main study sample categories based on education**

The results contained in the previous table (10) showed that sample included (48) trainers from five schools: Imam Mohamed Metwally Al-Shaarawy School for Applied Technology with a participation rate of (31.3%), Volkswagen School for Applied Technology with a participation rate of (18.8%), Electro Misr School for Applied Technology with a participation rate of (18.8%), Mechatronics School for Applied Technology with a participation rate of (16.7%), We School for Applied Technology with a participation rate of (14.6).

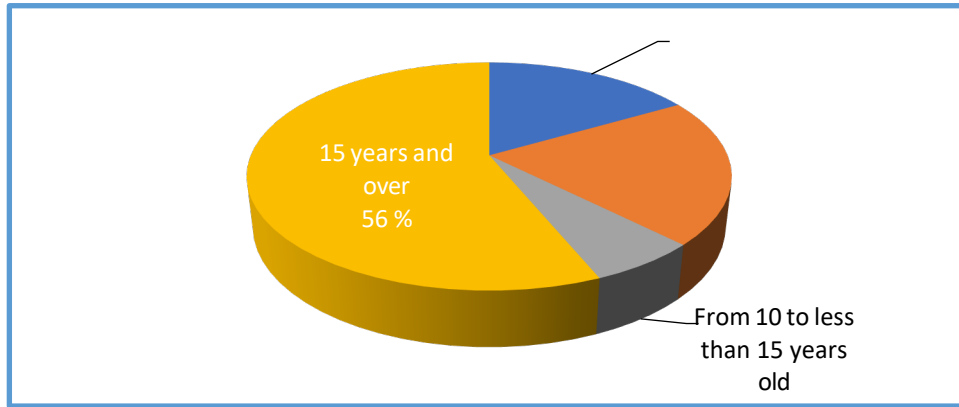
**These results can be illustrated by following figure (15):**



**Figure (15)**  
**The main study sample categories based on school**

The sample included four groups based on years of experience, The first group had experience (less than 5 years) with percentage (16.7%) of the total sample, The second group had experience (From 5 to less than 10 years) with percentage (20.8%), The third group had experience (From 10 to less than 15 years old) with percentage (6.3%), Finally, the fourth group had experience (15 years and over) with percentage (56.3%).

**These results can be illustrated in the following figure (16):**



**Figure (16)**  
The main study sample categories based on years of experience

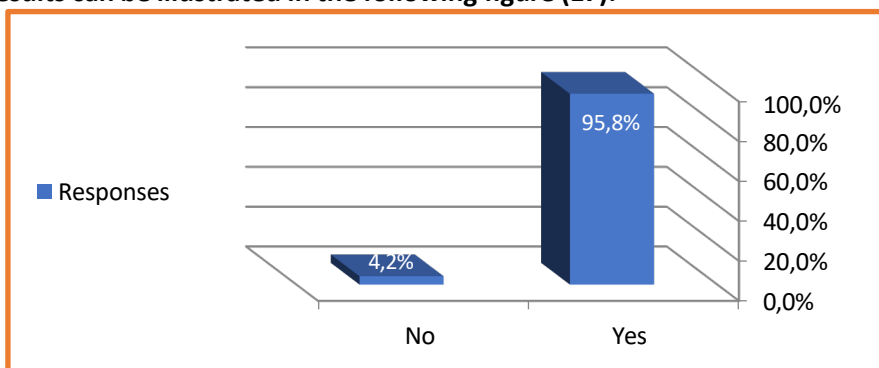
- **Question (1)**

**Table 23: Frequencies, Percentages, and Standard Deviations for trainers' opinions regarding the first question (N = 48)**

Question	Responses	Frequency	percent	Standard Deviation
Have you received on the job training courses related to the development of your professional competence?	Yes	46	95.8%	0.202
	No	2	4.2%	

results presented in previous table (11) showed that main sample from trainers responded to question: **“Have you received on the job training courses related to the development of your professional competence?”** responses were **“Yes”** at a rate of (95.8%), while the responses were **“No”** at a rate of (4.2%), The response to this question was standard deviation (0.202).

These results can be illustrated in the following figure (17):



**Figure (17)**  
Trainers' opinions regarding the first question

- **Question (2)**

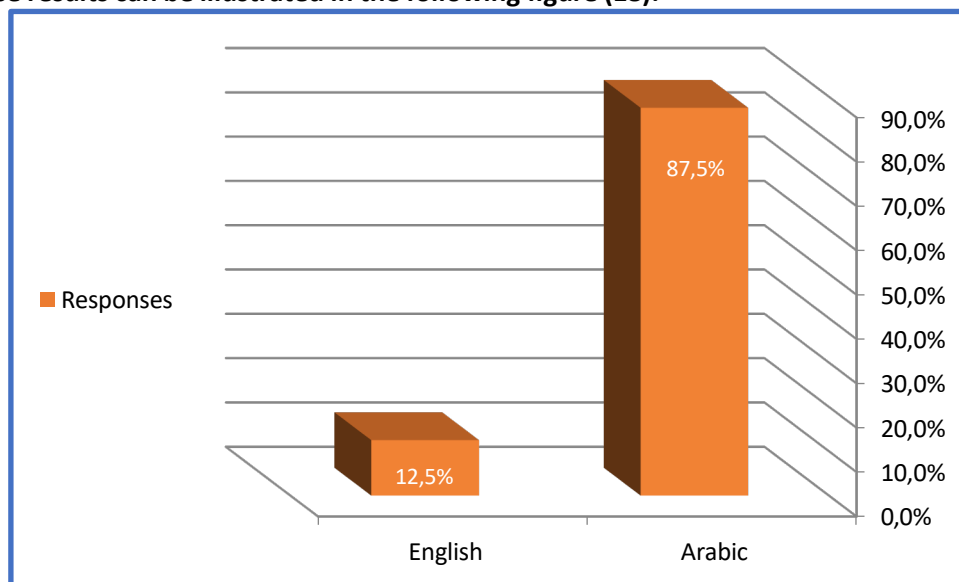


**Table 24: Frequencies, Percentages, and Standard Deviations for trainers' opinions regarding the second question (N = 48)**

Question	Responses	Frequency	percent	Standard Deviation
What is your favorite training language?	Arabic	42	87.5%	0.334
	English	6	12.5%	

Results presented in previous table (12) showed that main sample from trainers responded to question: **“What is your favorite training language?”** responses were **“Arabic”** at a rate of (87.5%), while the responses were **“English”** at a rate of (12.5%), The response to this question was standard deviation (0.334).

These results can be illustrated in the following figure (18):



**Figure (18)**  
**Trainers' opinions regarding the second question**

**Presentation and discussion of results:**

The results are presented through dimensions of the questionnaire each dimension separately as follows:

The fields of training needs necessary to develop professional competencies:

The following presents the responses of the study sample of teachers regarding the training areas they need to enhance their professional competencies in each field individually. It also shows the frequencies, percentages, means, standard deviations, and relative importance of each training area.

**Table 25: Frequencies, Percentages, Averages, and Standard Deviations for trainers' opinions**

Field of Training	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
	%	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
Developing behavioral skills (interpersonal skills)	N	0	1	2	15	30	4.54	0.683	91%	5	Very High
	%	0.0	2.1	4.2	31.3	62.5					
Interpretation of the curriculum structure	N	0	0	3	19	26	4.48	0.618	90%	6	Very High
	%	0.0	0.0	6.3	39.6	54.2					
Technology tools for learning	N	1	0	0	17	30	4.56	0.712	91%	3	Very High
	%	2.1	0.0	0.0	35.4	62.5					
Facilitate the learning process	N	0	0	3	15	30	4.56	0.616	91%	2	Very High
	%	0.0	0.0	6.3	31.3	62.5					
Planning the learning process	N	0	0	1	19	28	4.56	0.542	91%	1	Very High
	%	0.0	0.0	2.1	39.6	58.3					
implementation of the learning process	N	0	0	2	18	28	4.54	0.582	91%	4	Very High
	%	0.0	0.0	4.2	37.5	58.3					
Evaluation of the learning process	N	0	0	3	20	25	4.46	0.617	89%	7	Very High
	%	0.0	0.0	6.3	41.7	52.1					
<b>TOTAL</b>	N	0	0	1	14	33	4.53	0.503	91%	Very High	
	%	0.0	0.0	2.1	29.2	68.8					

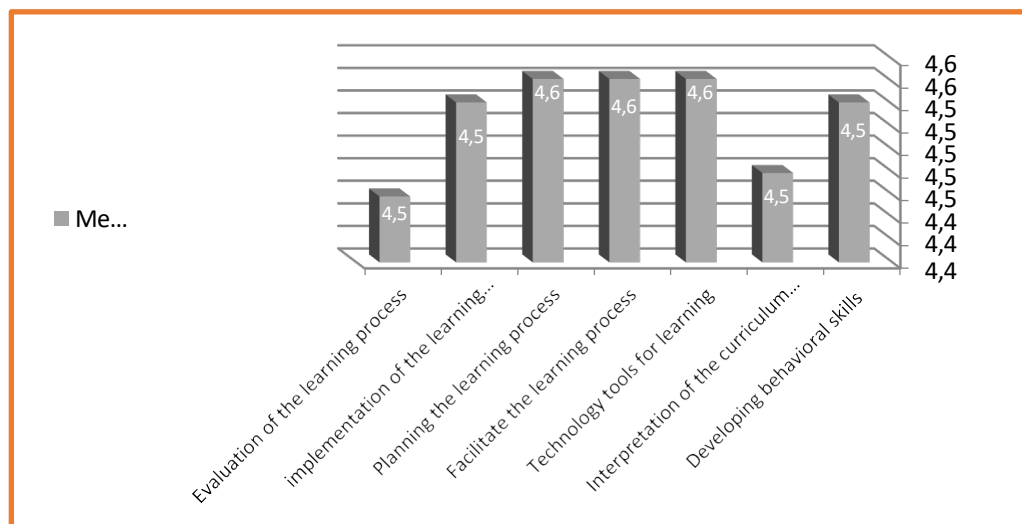
**It is clear from the statistical indicators for The field of training needs necessary to develop professional competencies in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the trainers' point of view that:**

- ❖ The general average of total Fields of Training : it reached (4.53) with a standard deviation (0.503); This confirms the opinion of the questionnaire respondents (teachers of Applied Technology Schools) which very high on level of need to train for developing professional competencies; This is because the weighted average of this total Fields of Training within scale category (4.21 to 5.00), which is considered

about positive direction from point of view for questionnaire sample, And it reflects the teachers' need for training in those areas.

- ❖ In the first rank, the trainers (questionnaire sample) highest need for training was in the field of **Planning the learning process**, the relative importance index of this filed reached (91%), reflecting the significant need for trainers to be trained in this field in order to develop professional competencies.
- ❖ In the second rank, the trainers (questionnaire sample) highest need for training was in the field of **Facilitate the learning process**, the relative importance index of this filed reached (91%), reflecting the significant need for trainers to be trained in this field in order to develop professional competencies.
- ❖ In the third rank, the trainers (questionnaire sample) highest need for training was in the field of **Technology tools for learning**, the relative importance index of this filed reached (91%), reflecting the significant need for trainers to be trained in this field in order to develop professional competencies.
- ❖ In the fourth rank, the trainers (questionnaire sample) highest need for training was in the field of **implementation of the learning process**, the relative importance index of this filed reached (91%), reflecting the significant need for trainers to be trained in this field in order to develop professional competencies.
- ❖ In the fifth rank, the trainers (questionnaire sample) highest need for training was in the field of **Developing behavioral skills (interpersonal skills)**, the relative importance index of this filed reached (91%), reflecting the significant need for trainers to be trained in this field in order to develop professional competencies.
- ❖ In the sixth rank, the trainers (questionnaire sample) highest need for training was in the field of **Interpretation of the curriculum structure**, the relative importance index of this filed reached (90%), reflecting the significant need for trainers to be trained in this field in order to develop professional competencies.
- ❖ In the seventh rank, the trainers (questionnaire sample) highest need for training was in the field of **Evaluation of the learning process**, the relative importance index of this filed reached (90%), reflecting the significant need for trainers to be trained in this field in order to develop professional competencies.

**These results can be illustrated in the following figure (19):**



**Figure (19)**

**Trainers' opinions about the fields of training needs necessary**

**First: The Technological Competencies**

The following presents the responses of the study sample of teachers regarding the Technological Competencies. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

**Table 26: Frequencies, Percentages, Averages, and Standard Deviations for trainers' opinions**

S	Technological Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
1	Basic computer skills in education.	N	1	1	3	16	27	4.40	0.869	88%	8	Very High
		%	2.1	2.1	6.3	33.3	56.3					
2	How to teach through virtual classrooms and educational platforms.	N	1	0	3	17	27	4.44	0.796	89%	5	Very High
		%	2.1	0.0	6.3	35.3	56.3					
3	How to use social networking sites for educational purposes.	N	1	1	3	15	28	4.42	0.871	88%	7	Very High
		%	2.1	2.1	6.3	31.3	58.3					
4	Preparing activities based on computer software.	N	1	0	2	18	27	4.46	0.771	89%	3	Very High
		%	2.1	0.0	4.2	37.5	56.3					
5	Preparing electronic tests.	N	0	0	4	19	25	4.44	0.649	89%	4	Very High
		%	0.0	0.0	8.3	39.6	52.1					
6	Preparing teaching and learning resources that enable the design of non-traditional learning situations.	N	0	1	0	17	30	4.58	0.613	92%	1	Very High
		%	0.0	2.1	0.0	35.4	62.5					
7	Employing educational technologies (electronic whiteboard, educational video) in teaching students.	N	1	0	5	13	29	4.44	0.848	89%	6	Very High
		%	2.1	0.0	10.4	27.1	60.4					
8	Employing laboratories, digital libraries and multiple learning resources in the learning process.	N	1	0	2	16	29	4.50	0.772	90%	2	Very High
		%	2.1	0.0	4.2	33.3	60.4					
<b>TOTAL</b>		N	1	0	2	11	34	4.46	0.638	89%	Very High	
		%	2.1	0.0	4.2	22.9	70.8					

**It is clear from the statistical indicators for The Technological Competencies in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the trainers' point of view that:**

- ❖ The general average of total Technological Competencies: it reached (4.46) with a standard deviation (0.638); This confirms the opinion of the questionnaire respondents (trainers of Applied Technology Schools) they need those competencies to very high degree; This is because the weighted average of this total Technological Competencies within scale category (4.21 to 5.00), which is considered about positive direction from point of view for questionnaire sample, And it reflects the trainers' need for training in the Technological Competencies.
- ❖ In the first rank, the trainers (questionnaire sample) highest need for training on the Competency of **Preparing teaching and learning resources that enable the design of non-traditional learning situations**, The relative importance index of this Competency reached (92%), reflecting the urgent need for trainers to be trained in those competency within the Technological competencies.
- ❖ In the second rank, the trainers (questionnaire sample) highest need for training on the Competency of **Employing laboratories, digital libraries and multiple learning resources in the learning process**, The relative importance index of this Competency reached (90%), reflecting the urgent need for trainers to be trained in those competency within the Technological competencies.
- ❖ In the third rank, the trainers (questionnaire sample) highest need for training on the Competency of **Preparing activities based on computer software**, The relative importance index of this Competency reached (89%), reflecting the urgent need for trainers to be trained in those competency within the Technological competencies.
- ❖ In the fourth rank, the trainers (questionnaire sample) highest need for training on the Competency of **Preparing electronic tests**, The relative importance index of this Competency reached (89%), reflecting the urgent need for trainers to be trained in those competency within the Technological competencies.
- ❖ In the fifth rank, the trainers (questionnaire sample) highest need for training on the Competency of **teaching through virtual classrooms and educational platforms**, The relative importance index of this Competency reached (89%), reflecting the urgent need for trainers to be trained in those competency within the Technological competencies.
- ❖ In the sixth rank, the trainers (questionnaire sample) highest need for training on the Competency of **Employing educational technologies (electronic whiteboard, educational video) in teaching students**, The relative importance index of this Competency reached (89%), reflecting the urgent need for trainers to be trained in those competency within the Technological competencies.
- ❖ In the seventh rank, the trainers (questionnaire sample) highest need for training on the Competency of **using social networking sites for educational purposes**, The relative importance index of this Competency reached (88%), reflecting the urgent need for trainers to be trained in those competency within the Technological competencies.
- ❖ In the eighth rank, the trainers (questionnaire sample) highest need for training on the Competency of **Basic computer skills in education**, The relative importance index of this Competency reached (88%), reflecting the urgent need for trainers to be trained in those competency within the Technological competencies.

**These results can be illustrated in the following figure (20) :**

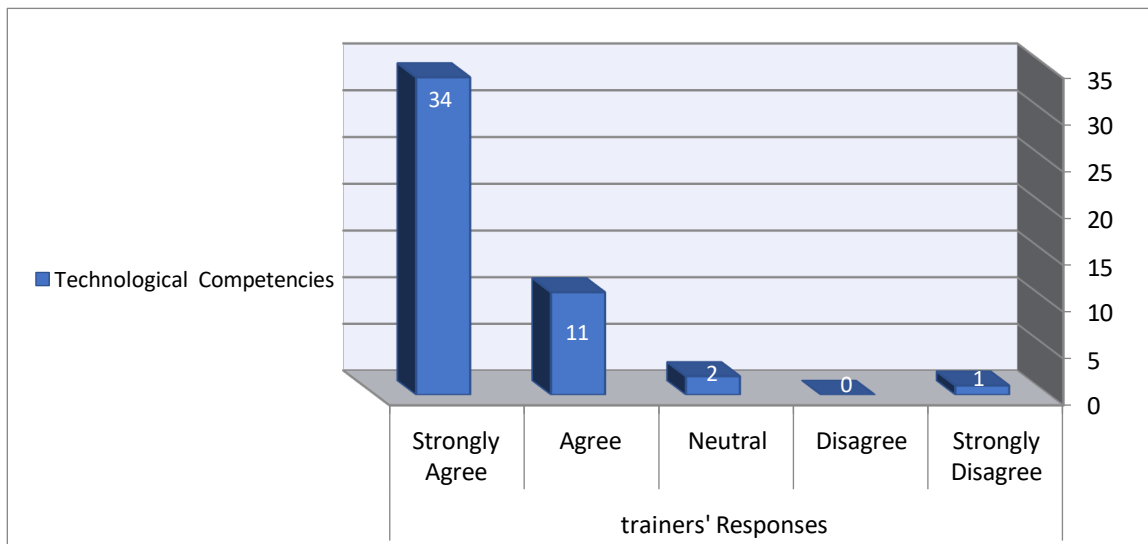


Figure (20)

**Trainers' responses of needs training about Technological Competencies as a whole**

Second: The professional competencies

The following presents the responses of the study sample of trainers regarding the professional Competencies. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

**Table 27: Frequencies, Percentages, Averages, and Standard Deviations for trainers' opinions**

S	professional Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
1	Crisis management and work pressures.	N	0	0	4	17	27	4.48	0.652	90%	6	Very High
		%	0.0	0.0	8.3	35.4	56.3					
2	Communication skills and communication with others.	N	0	1	7	15	25	4.33	0.808	87%	7	Very High
		%	0.0	2.1	14.6	31.3	52.1					
3	Teamwork skills.	N	0	1	3	14	30	4.52	0.714	90%	5	Very High
		%	0.0	2.1	6.3	29.2	62.5					
4	Designing electronic records using specialized programs.	N	0	0	2	16	30	4.58	0.577	92%	4	Very High
		%	0.0	0.0	4.2	33.3	62.5					

S	professional Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			%	Strongly Disagree	Disagree	Neutral	Agree					
5	Design educational situations that develop students' thinking and research capabilities.	N	0	0	1	18	29	4.58	0.539	92%	2	Very High
		%	0.0	0.0	2.1	37.5	60.4					
6	Conducting action research to solve school problems and improve the educational process.	N	0	0	1	17	30	4.60	0.536	92%	1	Very High
		%	0.0	0.0	2.1	35.4	62.5					
7	Activate communication channels between the school and the local community.	N	0	0	1	18	29	4.58	0.539	92%	3	Very High
		%	0.0	0.0	2.1	37.5	60.4					
TOTAL		N	0	0	1	14	33	4.53	0.499	91%	Very High	
		%	0.0	0.0	2.1	29.2	68.8					

**It is clear from the statistical indicators for the professional Competencies in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the trainers' point of view that:**

- ❖ The general average of total professional Competencies: it reached (4.53) with a standard deviation (0.499); This confirms the opinion of the questionnaire respondents (trainers of Applied Technology Schools) they need those competencies to very high degree; This is because the weighted average of this total professional Competencies within scale category (4.21 to 5.00), which is considered about positive direction from point of view for questionnaire sample, And it reflects the trainers' need for training in the professional Competencies.
- ❖ In the first rank, the trainers (questionnaire sample) highest need for training on the Competency of **Conducting action research to solve school problems and improve the educational process**, the relative importance index of this Competency reached (92%), reflecting the urgent need for trainers to be trained in that competency within the professional competencies.
- ❖ In the second rank, the trainers (questionnaire sample) highest need for training on the Competency of **Design educational situations that develop students' thinking and research capabilities**, the relative importance index of this Competency reached (92%), reflecting the urgent need for trainers to be trained in that competency within the professional competencies.
- ❖ In the third rank, the trainers (questionnaire sample) highest need for training on the Competency of **Activating communication channels between the school and the local community**, the relative importance index of this Competency reached (92%), reflecting the urgent need for trainers to be trained in that competency within the professional competencies.
- ❖ In the fourth rank, the trainers (questionnaire sample) highest need for training on the Competency of **Designing electronic records using specialized programs**, the relative importance index of this Competency reached (92%), reflecting the urgent need for trainers to be trained in that competency within the professional competencies.

- ❖ In the fifth rank, the trainers (questionnaire sample) highest need for training on the Competency of **Teamwork skills**, the relative importance index of this Competency reached (90%), reflecting the urgent need for trainers to be trained in that competency within the professional competencies.
- ❖ In the sixth rank, the trainers (questionnaire sample) highest need for training on the Competency of **Crisis management and work pressures**, the relative importance index of this Competency reached (90%), reflecting the urgent need for trainers to be trained in that competency within the professional competencies.
- ❖ In the seven rank, the trainers (questionnaire sample) highest need for training on the Competency of **Communication skills and communication with others**, the relative importance index of this Competency reached (87%), reflecting the urgent need for trainers to be trained in that competency within the professional competencies.

These results can be illustrated in the following figure (21):

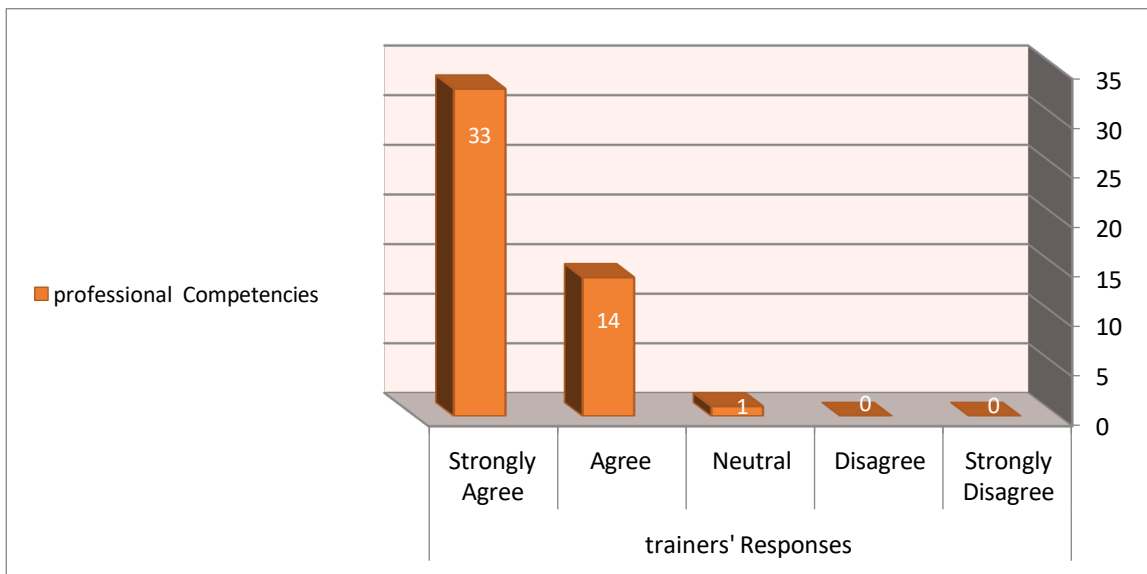


Figure (21)

Trainers' responses of needs training about professional competencies as a whole



### Third: Performance Competencies

The following presents the responses of the study sample of trainers regarding the Performance Competencies. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

**Table 28: Frequencies, Percentages, Averages, and Standard Deviations for trainers' opinions**

S	Performance Competencies	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
		%	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
1	Modern teaching strategies, active and collaborative learning.	N	0	1	6	13	28	4.42	0.794	88%	6	Very High
		%	0.0	2.1	12.5	27.1	58.3					
2	Face-to-face workshops.	N	0	0	3	17	28	4.52	0.618	90%	1	Very High
		%	0.0	0.0	6.3	3.4	58.3					
3	Laboratory work.	N	0	0	6	23	19	4.27	0.676	85%	7	Very High
		%	0.0	0.0	12.5	47.9	39.6					
4	Methods and methods of diversification of teaching.	N	0	0	4	17	27	4.48	0.652	90%	3	Very High
		%	0.0	0.0	8.3	35.4	56.3					
5	Employing modern technology in teaching.	N	1	0	1	17	29	4.52	0.743	90%	2	Very High
		%	2.1	0.0	2.1	35.4	60.4					
6	Teaching online (Teaching on the Internet).	N	1	1	7	18	21	4.19	0.915	84%	8	High
		%	2.1	2.1	14.6	37.5	43.8					
7	Class and time management skills.	N	0	1	4	17	26	4.42	0.739	88%	5	Very High
		%	0.0	2.1	8.3	35.4	54.2					
8	Evaluate students in a variety of ways and methods.	N	0	1	3	17	27	4.46	0.713	89%	4	Very High
		%	0.0	2.1	6.3	35.4	56.3					
<b>TOTAL</b>		N	0	1	2	12	33	4.41	0.576	88%	Very High	
		%	0.0	2.1	4.2	25.0	68.8					

**It is clear from the statistical indicators for The Performance Competencies in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the trainers' point of view that:**

- ❖ The general average of total Performance Competencies: it reached (4.41) with a standard deviation (0.576); This confirms the opinion of the questionnaire respondents (trainers of Applied Technology Schools) they need those competencies to very high degree; This is because the weighted average of this total Performance Competencies within scale category (4.21 to 5.00), which is considered about positive direction from point of view for questionnaire sample, And it reflects the trainers' need for training in the Performance Competencies.
- ❖ In the first rank, the trainers (questionnaire sample) highest need for training on the Competency of **face-to-face workshops**, the relative importance index of this Competency reached (90%), reflecting the urgent need for trainers to be trained in that competency within the Performance competencies.
- ❖ In the second rank, the trainers (questionnaire sample) highest need for training on the Competency of **Employing modern technology in teaching**, the relative importance index of this Competency reached (90%), reflecting the urgent need for trainers to be trained in that competency within the Performance competencies.
- ❖ In the third rank, the trainers (questionnaire sample) highest need for training on the Competency of **Diversifying Methods and methods of teaching**, the relative importance index of this Competency reached (90%), reflecting the urgent need for trainers to be trained in that competency within the Performance competencies.
- ❖ In the fourth rank, the trainers (questionnaire sample) highest need for training on the Competency of **Evaluating students in a variety of ways and methods**, the relative importance index of this Competency reached (89%), reflecting the urgent need for trainers to be trained in that competency within the Performance competencies.
- ❖ In the fifth rank, the trainers (questionnaire sample) highest need for training on the Competency of **Class and time management skills**, the relative importance index of this Competency reached (88%), reflecting the urgent need for trainers to be trained in that competency within the Performance competencies.
- ❖ In the sixth rank, the trainers (questionnaire sample) highest need for training on the Competency of **Modern teaching strategies, active and collaborative learning**, the relative importance index of this Competency reached (88%), reflecting the urgent need for trainers to be trained in that competency within the Performance competencies.
- ❖ In the seventh rank, the trainers (questionnaire sample) highest need for training on the Competency of **Laboratory work**, the relative importance index of this Competency reached (85%), reflecting the urgent need for trainers to be trained in that competency within the Performance competencies.
- ❖ In the eighth rank, the trainers (questionnaire sample) highest need for training on the Competency of **Teaching online (Teaching on the Internet)**, the relative importance index of this Competency reached (84%), reflecting the urgent need for trainers to be trained in that competency within the Performance competencies.
- ❖ **These results can be illustrated in the following figure (22):**

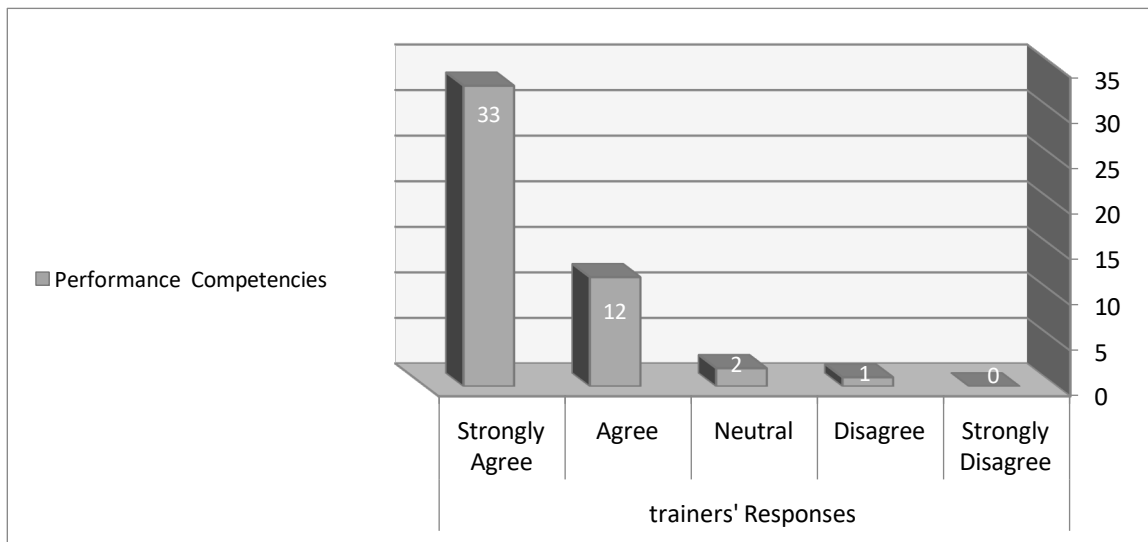


Figure (22)

**Trainers' responses of needs training about Performance Competencies as a whole**

Fourth: The Teaching Experiences

The following presents the responses of the study sample of trainers regarding Teaching Experiences. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

**Table 29: Frequencies, Percentages, Averages, and Standard Deviations for trainers' opinions**

S	Teaching Experiences	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
1	I enjoy teaching to my students.	N	0	1	0	8	39	4.77	0.555	95%	1	Very High
		%	0.0	2.1	0.0	16.7	81.3					
2	My teaching focuses on presenting information well to students.	N	1	1	0	11	35	4.63	0.789	93%	10	Very High
		%	2.1	2.1	0.0	22.9	72.9					
3	I am organized and methodical as a teacher.	N	0	0	1	13	34	4.69	0.512	94%	3	Very High
		%	0.0	0.0	2.1	27.1	70.8					
4	I find it difficult to help students learn.	N	4	7	4	18	15	3.69	1.291	74%	14	High
		%	8.3	14.6	8.3	37.5	31.3					

S	Teaching Experiences	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			%	Strongly Disagree	Disagree	Neutral	Agree					
5	I put a lot of effort into my teaching.	N	0	4	2	25	17	4.15	0.850	83%	12	High
		%	0.0	8.3	4.2	52.1	35.4					
6	The most important goal of my teaching is to communicate what I know to students.	N	4	8	3	15	18	3.73	1.349	75%	13	High
		%	8.3	16.7	6.3	31.3	37.5					
7	I spend a lot of time preparing and planning the lesson.	N	0	2	3	19	24	4.35	0.785	87%	11	Very High
		%	0.0	4.2	6.3	39.6	50.0					
8	In my daily teaching, I am free to choose my teaching methods and strategies.	N	0	0	1	13	34	4.69	0.512	94%	4	Very High
		%	0.0	0.0	2.1	27.1	70.8					
9	In my teaching, I create situations in which I encourage students to discuss their thoughts and opinions on the topic of the lesson.	N	13	11	12	8	4	2.56	1.287	51%	16	Medium
		%	27.1	22.9	25.0	16.7	8.3					
10	The student learning process is so complex that it is a challenge for me.	N	5	12	8	13	10	3.23	1.325	65%	15	Medium
		%	10.4	25.0	16.7	27.1	20.8					
11	I spend most of my teaching time imparting information to students about the topic.	N	0	0	0	16	32	4.67	0.476	93%	6	Very High
		%	0.0	0.0	0.0	33.3	66.7					
12	During teaching I provide an opportunity for students to deepen their understanding of the topic of the lesson through discussion.	N	0	0	0	18	30	4.63	0.489	93%	7	Very High
		%	0.0	0.0	0.0	37.5	62.5					
13	Allocate time for the students to discuss among themselves the basic concepts of the topic of the lesson.	N	0	0	0	18	30	4.63	0.489	93%	8	Very High
		%	0.0	0.0	0.0	37.5	62.5					

S	Teaching Experiences	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			%	Strongly Disagree	Disagree	Neutral	Agree					
14	I carefully analyze the feedback I receive from students.	N	0	0	0	15	33	4.69	0.468	94%	5	Very High
		%	0.0	0.0	0.0	31.3	68.8					
15	I benefit from the feedback from the students in the development of my teaching.	N	0	0	0	18	30	4.63	0.489	93%	9	Very High
		%	0.0	0.0	0.0	37.5	62.5					
16	I regularly try new methods to implement my teaching based on student feedback.	N	0	0	0	13	35	4.73	0.449	95%	2	Very High
		%	0.0	0.0	0.0	27.1	72.9					
TOTAL		N	0	0	0	17	31	4.28	0.336	86%	Very High	
		%	0.0	0.0	0.0	35.4	64.6					

It is clear from the statistical indicators for teaching Experiences in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the trainers' point of view that:

- ❖ The general average of total Teaching Experiences: it reached (4.28) with a standard deviation (0.336); This confirms the opinion of the questionnaire respondents (trainers of Applied Technology Schools) they need those Competencies to very high degree; This is because the weighted average of this total Teaching Experiences within scale category (4.21 to 5.00), which is considered about positive direction from point of view for questionnaire sample, And it reflects the trainers' need for training in the Teaching Experiences.
- ❖ In the first rank, the trainers (questionnaire sample) highest need for training on item of **I enjoy teaching to my students**, The relative importance index of this competency reached (95%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the second rank, the trainers (questionnaire sample) highest need for training on item of **I regularly try new methods to implement my teaching based on student feedback**, The relative importance index of this competency reached (95%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the third rank, the trainers (questionnaire sample) highest need for training on item of **I am organized and methodical as a teacher**, The relative importance index of this competency reached (94%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the fourth rank, the trainers (questionnaire sample) highest need for training on item of **In my daily teaching, I am free to choose my teaching methods and strategies**, The relative importance index of this competency reached (94%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.

- ❖ In the fifth rank, the trainers (questionnaire sample) highest need for training on item of **I carefully analyze the feedback I receive from students**, The relative importance index of this competency reached (94%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the sixth rank, the trainers (questionnaire sample) highest need for training on item of **I spend most of my teaching time imparting information to students about the topic**, The relative importance index of this competency reached (93%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the seventh rank, the trainers (questionnaire sample) highest need for training on item of **During teaching I provide an opportunity for students to deepen their understanding of the topic of the lesson through discussion**, The relative importance index of this competency reached (93%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the eighth rank, the trainers (questionnaire sample) highest need for training on item of **Allocate time for the students to discuss among themselves the basic concepts of the topic of the lesson**, The relative importance index of this competency reached (93%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the ninth rank, the trainers (questionnaire sample) highest need for training on item of **I benefit from the feedback from the students in the development of my teaching**, The relative importance index of this competency reached (93%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the tenth rank, the trainers (questionnaire sample) highest need for training on item of **My teaching focuses on presenting information well to students**, The relative importance index of this competency reached (93%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the Eleventh rank, the trainers (questionnaire sample) highest need for training on item of **I spend a lot of time preparing and planning the lesson**, The relative importance index of this competency reached (87%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the Twelfth rank, the trainers (questionnaire sample) highest need for training on item of **I put a lot of effort into my teaching**, The relative importance index of this competency reached (83%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the Thirteenth rank, the trainers (questionnaire sample) highest need for training on item of **The most important goal of my teaching is to communicate what I know to students**, The relative importance index of this competency reached (75%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the Fourteenth rank, the trainers (questionnaire sample) highest need for training on item of **I find it difficult to help students learn**, The relative importance index of this competency reached (74%), reflecting the urgent need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the Fifteenth rank, the trainers (questionnaire sample) medium need for training on item of **The student learning process is so complex that it is a challenge for me**, The relative importance index of this competency reached (65%), reflecting the medium need for trainers to be trained in that competency within the Teaching Experiences.
- ❖ In the Sixteenth and last rank , the trainers (questionnaire sample) medium need for training on item of **In my teaching, I create situations in which I encourage students to discuss their thoughts and opinions on the topic of the lesson**, The relative importance index of this competency reached (51%), reflecting the medium need for trainers to be trained in that competency within the Teaching Experiences.

These results can be illustrated in the following figure (23):

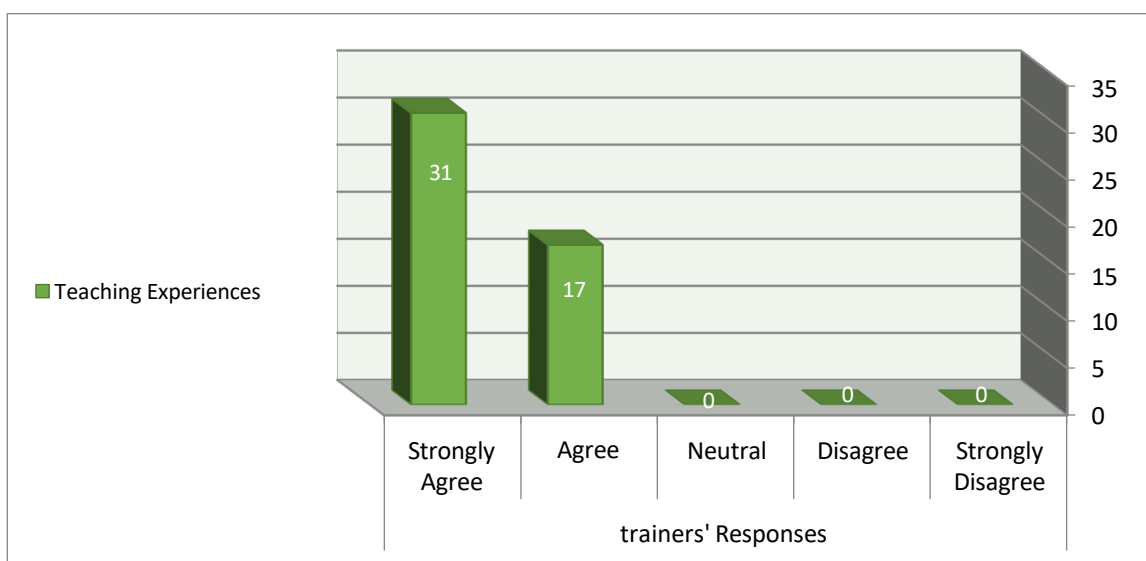


Figure (23)

**Trainers' responses of needs training about the Teaching Experiences as a whole**

**Fifth: The Environmental and Community Work Experiences**

The following presents the responses of the study sample of teachers regarding The Environmental and Community Work Experiences. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

**Table 30: Frequencies, Percentages, Averages, and Standard Deviations for trainers' opinions**

S	Work Experiences	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree					
1	The subjects I teach are meaningful to me.	N	0	4	7	16	21	4.13	0.959	83%	6	High
		%	0.0	8.3	14.6	33.3	43.8					
2	I feel that I can influence my working conditions.	N	0	3	7	21	17	4.08	0.871	82%	7	High
		%	0.0	6.3	14.6	43.8	35.4					
3	My classmates will listen if I tell them about the challenges I face in my teaching.	N	0	0	4	25	19	4.31	0.624	86%	2	Very High
		%	0.0	0.0	8.3	52.1	39.6					
4	I sometimes work collaboratively with my colleagues.	N	0	4	3	16	25	4.29	0.922	86%	4	Very High
		%	0.0	8.3	6.3	33.3	52.1					

S	Work Experiences	N	Responses					Mean	Standard Deviation	Relative Importance Index	Ranking	Level of Need
			%	Strongly Disagree	Disagree	Neutral	Agree					
5	My colleagues are open to new ideas related to education.	N	0	0	2	22	24	4.46	0.582	89%	1	Very High
		%	0.0	0.0	4.2	45.8	50.0					
6	I sometimes work collaboratively with employers (institutions, companies, factories).	N	0	1	6	19	22	4.29	0.771	86%	3	Very High
		%	0.0	2.1	12.5	39.6	45.8					
7	My work community values the teaching profession and its prestige.	N	2	4	2	16	24	4.17	1.117	83%	5	High
		%	4.2	8.3	4.2	33.3	50.0					
TOTAL		N	0	0	1	22	25	4.25	0.461	85%	Very High	
		%	0.0	0.0	2.1	45.8	52.1					

It is clear from the statistical indicators for the Environmental and Community Work Experiences in questionnaire of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the trainers' point of view that:

- ❖ The general average of total the Environmental and Community Work Experiences: it reached (4.25) with a standard deviation (0.461); This confirms the opinion of the questionnaire respondents (trainers of Applied Technology Schools) they need those competencies to very high degree; This is because the weighted average of this total Experiences within scale category (4.21 to 5.00), which is considered about positive direction from point of view for questionnaire sample, And it reflects the trainers' need for training in the Environmental and Community Work Experiences.
- ❖ In the first rank, the trainers (questionnaire sample) highest need for training on item of **My colleagues are open to new ideas related to education**, The relative importance index of this Competency reached (89%), reflecting the urgent need for trainers to be trained in those competency within the Environmental and Community Work Experiences.
- ❖ In the second rank, the trainers (questionnaire sample) highest need for training on item of **my classmates will listen if I tell them about the challenges I face in my teaching**, The relative importance index of this Competency reached (86%), reflecting the urgent need for trainers to be trained in those competency within the Environmental and Community Work Experiences.
- ❖ In the third rank, the trainers (questionnaire sample) highest need for training on item of **I sometimes work collaboratively with employers (institutions, companies, factories)**, the relative importance index of this Competency reached (86%), reflecting the urgent need for trainers to be trained in those competency within the Environmental and Community Work Experiences.
- ❖ In the fourth rank, the trainers (questionnaire sample) highest need for training on item of **I sometimes work collaboratively with my colleagues**, the relative importance index of this Competency reached (86%), reflecting the urgent need for trainers to be trained in those competency within the Environmental and Community Work Experiences.



- ❖ In the fifth rank, the trainers (questionnaire sample) highest need for training on item of **My work community values the teaching profession and its prestige**, the relative importance index of this Competency reached (83%), reflecting the urgent need for trainers to be trained in those competency within the Environmental and Community Work Experiences.
- ❖ In the sixth rank, the trainers (questionnaire sample) highest need for training on item of **The subjects I teach are meaningful to me**, the relative importance index of this Competency reached (83%), reflecting the urgent need for trainers to be trained in those competency within the Environmental and Community Work Experiences.
- ❖ In the seventh and last rank, the trainers (questionnaire sample) highest need for training on item of **I feel that I can influence my working conditions**, the relative importance index of this Competency reached (82%), reflecting the urgent need for trainers to be trained in those competency within the Environmental and Community Work Experiences.

These results can be illustrated in the following figure (24):

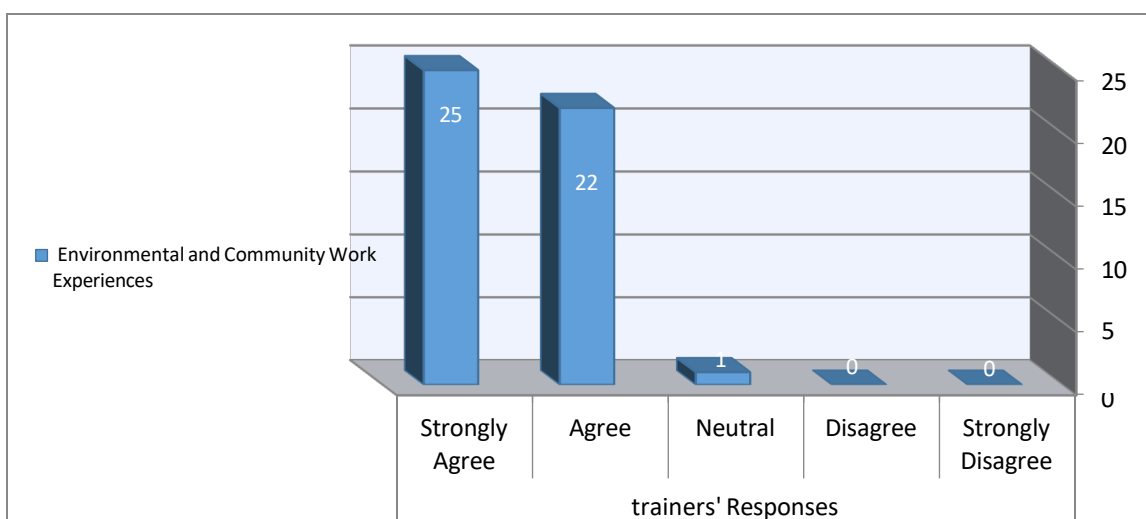


Figure (24)

Teachers' responses of needs training about Environmental and Community Work Experiences as a whole

**Questionnaire as a whole:**

The following presents the responses of the study sample of trainers regarding Competencies as a whole. It also shows the frequencies, percentages, means, standard deviations, and relative importance index of each Competency.

Table 31: Frequencies, Percentages, Averages, and Standard Deviations for trainers' opinions

No	Competencies	Weighted Average	Std. Deviation	Relative Importance Index	Ranking	Degree of Need
1	The Technological Competencies	4.46	0.638	89%	2	Very High
2	The Professional Competencies	4.53	0.499	91%	1	Very High

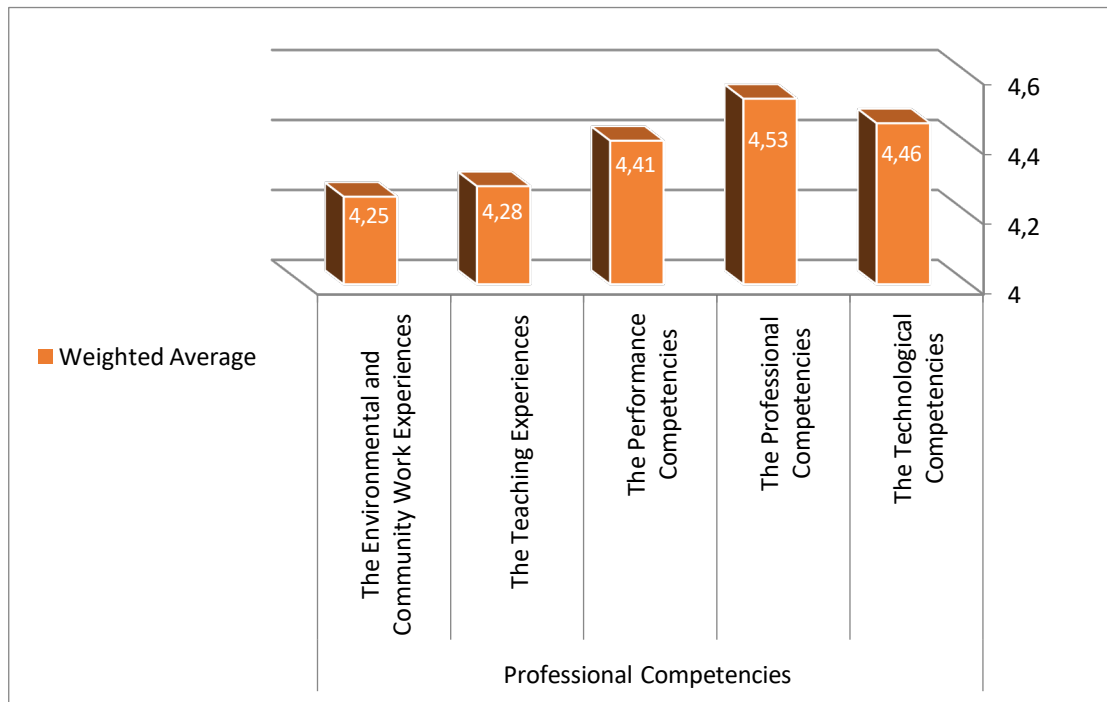
3	The Performance Competencies	4.41	0.576	88%	3	Very High
4	The Teaching Experiences	4.28	0.336	86%	4	Very High
5	The Environmental and Community Work Experiences	4.25	0.461	85%	5	Very High
<b>Weighted average of Questionnaire as a whole</b>		<b>4.38</b>	<b>0.359</b>	<b>88%</b>	<b>Very High</b>	

It is clear from statistical indicators of the necessary Professional Competencies for Teachers in Applied Technology Schools (ATS) from the trainers' point of view questionnaire that:

The weighted average of questionnaire as a whole was (4.38) with a standard deviation of (0.359); It confirms the sample questionnaire's positive opinion on need developing of Professional Competencies for Teachers in Applied Technology Schools (ATS); This is because the weighted average of questionnaire within scale category (4.21 to 5.00), and The relative importance index of this questionnaire as a whole reached (88%), which is considered to be from direction of positivity from the point of view of the sample of questionnaire (trainers in Applied Technology Schools).

- ❖ **First Rank:** the Professional Competencies got first rank, the relative importance index of this Competency reached (91%), which expresses urgent need for trainers to be trained in those competencies.
- ❖ **Second Rank:** the Technological Competencies got second rank, the relative importance index of this Competency reached (89%), which expresses urgent need for trainers to be trained in those competencies.
- ❖ **Third Rank:** the Performance Competencies got third rank, the relative importance index of this Competency reached (88%), which expresses great need for trainers to be trained in those competencies.
- ❖ **Fourth Rank:** the Teaching Experiences got fourth rank, the relative importance index of this Competency reached (86%), which expresses great need for trainers to be trained in those competencies.
- ❖ **Fifth Rank:** the Environmental and Community Work Experiences got fifth rank, the relative importance index of this Competency reached (85%), which expresses great need for trainers to be trained in those competencies.

**These results can be illustrated by following figure (25):**



**Figure (25)**  
**Necessary Professional Competencies for Teachers in Applied Technology Schools (ATS)**  
**from the trainers' point of view**

**Open-Ended Questions :**

- ❖ As expressed by teachers of applied technology schools through their open-ended responses, they showed a desire to deepen their knowledge in the following areas: modern teaching methods and strategies, both in-class and extracurricular activities, competency-based education, modern technology, test preparation, various assessment tools, time management, computer skills, distance learning, programming, and networking.
- ❖ When asked about their **training needs**, teachers of applied technology schools pointed out the following:
  - Training on assessment methods that align with the competency-based education system.
  - Understanding curriculum frameworks and competency-based systems.
  - Utilization of educational resources and materials.
  - Assessing students through various methods.
  - Managing the learning environment.

**Discussion of the study results**

By presenting the findings of questionnaires conducted among teachers and trainers to identify the needs of teachers in applied technological schools, those needs indicating the requirements and necessities teachers require to develop their skills and abilities in the field of teaching, it is clear that professional training and development are critical factors for teachers' success in their profession.

**Researchers attribute these findings to various possible causes, which are listed below:**

- ❖ Adapting to educational advancements: The area of education is always growing, and teachers must training to stay current and implement innovative teaching approaches.

- ❖ Improving teaching abilities: Teachers may need training to improve their class preparation, execution, and student evaluation abilities. This could entail employing new teaching methodologies, implementing novel educational tactics, and analysing student data in order to provide successful instruction.
- ❖ Technological advancements: As technology and remote learning evolve, teachers will require training in the use of digital tools and technologies for teaching and administering virtual classrooms. This could include learning how to hold online discussions, generate digital instructional tools, and evaluate performance online.
- ❖ The need for educational technology: In this day and age, instructors may confront difficulties in properly implementing educational technology in the classroom. They may require training on available tools and applications as well as how to use them into the educational process in order to improve students' learning experiences.
- ❖ Classroom management and behaviour enhancement: Teachers must also learn classroom management techniques and tactics for dealing with a variety of student misbehaviour. This can include encouraging pleasant interactions in the classroom and using effective communication to address possible problems.
- ❖ Improving assessment skills: Assessment is an important aspect of the educational process. Teachers must be trained to evaluate student performance and analyse assessment data in order to discover strengths and shortcomings and adapt their teaching techniques accordingly.
- ❖ Cultural variety among students: Teachers may face difficulties while engaging with students from varied cultural backgrounds. Cultural training can help teachers grasp distinct cultural barriers and use effective techniques to improve student comprehension and communication.
- ❖ Promoting mental health and balance: Teachers are subjected to psychological pressures and daily obstacles in the classroom. They require stress management training as well as assistance in improving their mental health and work-life balance.
- ❖ Peer-to-peer learning: Learning and sharing among instructors are vital activities for improving good educational practices. To improve their teaching ability, teachers may require training on how to work as a team, exchange experiences, resources, and ideas with colleagues.
- ❖ Developing communication skills with parents: Teachers may need to strengthen their communication and partnering skills with parents. Training in effective communication, resolving difficult circumstances, and strengthening family and school collaboration can be offered.

Finally, Professional development is a vital part of teachers' lives since it helps them enhance their educational practices and students' learning experiences. Therefore, the training process should be continuing.

### **Results of Focus Group with School Leaders about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS):**

This part reviews the results of the analysis of focus group, explaining the most important findings of the analysis of the data of those meetings, in order to achieve the objectives of the study represented in the main objective of the study, which is: **Determining the training needs necessary to improve the professional competence of teachers of applied schools of technology.**

Where the results of the analysis of the interviews with the leaders of schools in the five schools included in the basic experiment revealed in-depth analyzes on how to improve the professional competencies of the teachers of applied technology schools, by identifying the most important training needs of the teachers of those schools, as well as highlighting the strengths and weaknesses of the teachers of those schools from school leaders' opinions.

### **Coding Methodology in Qualitative Research:**

Coding outcomes in qualitative research involves the practice of classifying and examining data to recognize significant motifs, trends, or ideas. Here are a few guidelines to contemplate while coding qualitative data (Basit, 2003) (Oun & Bach, 2014):

1. **Familiarize yourself with the data:** Go through the data thoroughly to obtain a comprehensive grasp of the content. This might involve examining interview transcripts, field notes, or any other qualitative data sources.
2. **Develop a coding system:** Make a coding system or a set of starting codes that speak to diverse viewpoints or topics inside the information. These codes can be determined from the investigate questions, existing hypotheses, or developing designs from the information itself.
3. **Open coding:** Begin with an open coding approach where you dole out graphic names or codes to little areas of the information. This prepare includes distinguishing and labeling diverse concepts, subjects, or designs that rise from the information.
4. **Organize codes into categories:** As you advance, you'll begin to distinguish commonalities or connections between codes. Bunch related codes into broader categories or sub-themes. This makes a difference to organize and structure the information in a significant way.
5. **Review and refine:** Persistently survey and refine the coding system as you pick up a more profound understanding of the information. You'll got to reexamine, combine, or make unused codes and categories based on developing experiences or designs.
6. **Maintain consistency:** Guarantee consistency in coding by setting up clear coding rules or code definitions. This helps keep up unwavering quality and permits for collaboration in the event that numerous coders are included within the examination.
7. **Interpret and analyze:** Once the coding is total, analyze the coded information by analyzing the connections between categories, distinguishing overwhelming subjects, and investigating designs or degenerate cases. This elucidation handle includes going past the expressive level and drawing significant conclusions from the information.
8. **Provide prove and cases:** When announcing the coding comes about, give prove from the information by counting particular cites, cases, or passages that back the recognized subjects or designs. This makes a difference to improve the validity and reliability of the discoveries.

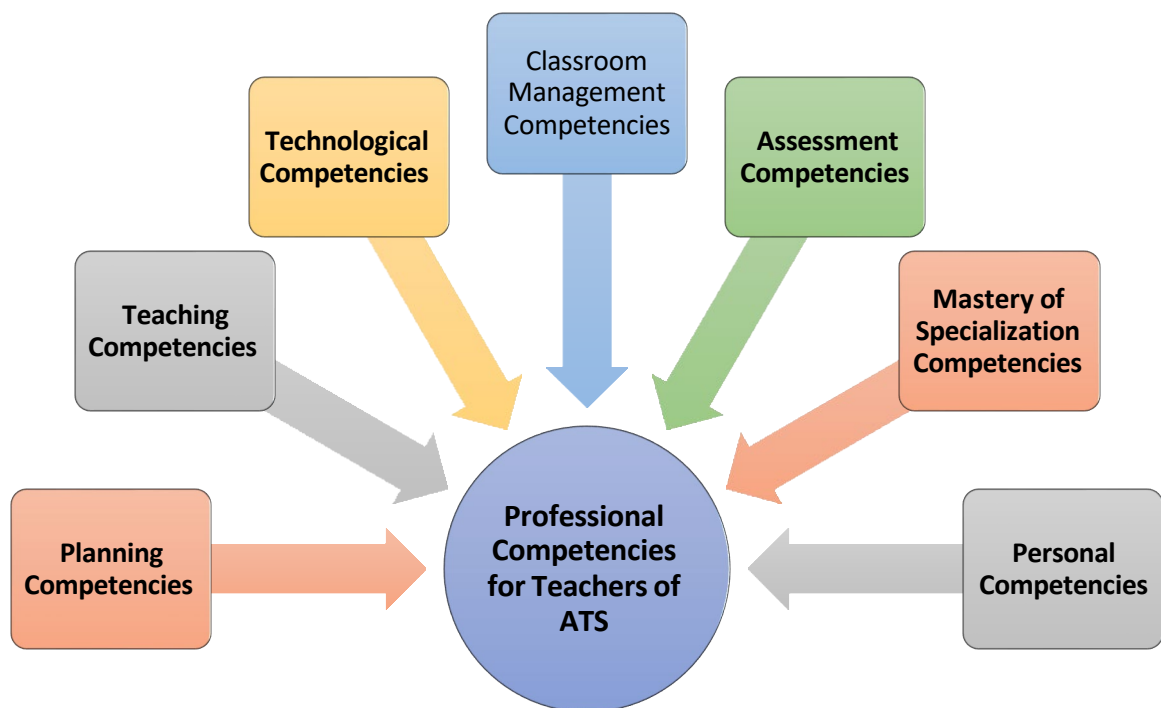
**The results of the interviews (focus group) were presented as follows:**

The interviews that took place through the focus group were analyzed by the method used in the qualitative research method, where the researchers transcribed each of the interviews and wrote them in detail without any abbreviation or brevity, and those interviews were read three times in order to identify the main points in the interviews, so that A code (title) was given to each relevant part of the text, then the interrelated codes were collected under themes, linking the themes and quotations derived from the perceptions of the study sample (schools leaders). The codes are the first codes of their names in the form: (the first code of the first name. The first code of the family name).

The results of the focus group were reached through the qualitative analysis of the in-depth and open interviews that took place with (5) schools leaders of applied technology schools, (1) a school leader from each school, and the interviews were conducted with the schools leaders directly, and the duration of the interview ranged from (75) to (90) minutes. Through it, the researchers asked a set of questions, after explaining the objectives of the interview (and asking permission to record the interview, and the researchers pledged not to use it except for the purposes of scientific research).

**The following is a detailed presentation of the results reached after data collection and analysis, as follows:**

The schools leaders' opinions about the necessary competencies for the teachers of the Applied Technological Schools emanated from the existence of several competencies represented in a group of themes, as shown in the figure (26):



The following are the findings:

Table (20) shows the Themes and codes included in Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS) from schools leaders' opinions:

**Table 32: Schools leaders' opinions about Necessary Professional Competencies**

Themes	Codes	Analysis	
		Frequency	Percent
		N	%
Planning Competencies	Lesson Preparation	3	9.4
	Lesson planning	4	12.5
	Activities design	4	12.5
	Considering Individual Differences	8	25.0
	Multiple Intelligences	3	9.4
	Student Characteristics	1	3.1
	Gifted Student	3	9.4
	Weak Student	2	6.3
	Learner Preferences	2	6.3
	students' needs	2	6.3
	<b>Total</b>	<b>32</b>	<b>100.0</b>
Teaching Competencies	Motivation Enhancement	3	2.7
	class activities	2	1.8
	Extracurricular activities	2	1.8

Themes	Codes	Analysis	
		Frequency	Percent
		N	%
	different activities	3	2.7
	Teaching aids	2	1.8
	Diversifying teaching strategies	12	10.8
	different learning strategies	8	7.2
	Modern teaching methods	7	6.3
	Modern teaching strategies	4	3.6
	working groups	3	2.7
	Work in groups	4	3.6
	Student Grouping	2	1.8
	Repetition of Explanation	1	0.9
	Different Learning Styles	6	5.4
	Differentiated Instruction	3	2.7
	Teaching innovation	2	1.8
	Teaching skills	2	1.8
	Active learning	6	5.4
	Simplifying Information	8	7.2
	Brainstorming	2	1.8
	Dialogue and discussion	2	1.8
	Storytelling	2	1.8
	Link the new to the previous	3	2.7
	Gradual Information Presentation	4	3.6
	Financial encouragement	2	1.8
	Moral encouragement	2	1.8
	Diversifying Stimuli	2	1.8
	Engaging Students	3	2.7
	get attention	5	4.5
	Avoid boredom	1	0.9
	Dealing with students	3	2.7
	<b>Total</b>	<b>111</b>	<b>100.0</b>
Technological Competencies	technological development	1	2.5
	Modern technological tools	9	22.5
	technology in teaching	3	7.5
	search for information	2	5.0
	Utilizing Learning Resources	3	7.5
	Knowledge bank	2	5.0
	data show	3	7.5
	PowerPoint	2	5.0
	smart board	3	7.5
	tablet	2	5.0
	Laptop	2	5.0
	multiple knowledge resources	5	12.5
	Internet Websites	3	7.5
	<b>Total</b>	<b>40</b>	<b>100.0</b>

Themes	Codes	Analysis	
		Frequency	Percent
		N	%
Classroom Management Competencies	Classroom organization	4	6.3
	Classroom management	7	10.9
	time management	6	9.4
	Classroom Administration	11	17.2
	Classroom Discipline	9	14.1
	communication skills	7	10.9
	Interpersonal Skills	3	4.7
	Student Competition	3	4.7
	Peer learning	4	6.3
	Student guidance	2	3.1
	Facilitator teacher	3	4.7
	Instructive Teacher	3	4.7
	One-on-One Interaction	1	1.6
	Multiple interaction	1	1.6
<b>Total</b>	<b>64</b>	<b>100.0</b>	
Assessment Competencies	Remediation of Weak Points	2	3.6
	Reinforcement of Strengths	2	3.6
	Assessment	7	12.7
	Question banks	5	9.1
	material incentive	2	3.6
	Moral incentive	2	3.6
	Therapeutic programmes	5	9.1
	evaluation competences	1	1.8
	Tests Construction	8	14.5
	Results Analysis	2	3.6
	Question Formulation	3	5.5
	improvement plan	2	3.6
	Innovative Evaluation	2	3.6
	Objective Questions	3	5.5
	Essay Questions	3	5.5
	Student Monitoring	2	3.6
	Enrichment plans	2	3.6
	Intervention Plans	2	3.6
<b>Total</b>	<b>55</b>	<b>100.0</b>	
Mastery of Specialization Competencies	Subject requirements	1	4.3
	Self-development	3	13.0
	Core Competencies	2	8.7
	Proficient Teacher	6	26.1
	Competent teacher	5	21.7
	innovative	3	13.0
	creative	3	13.0
	<b>Total</b>	<b>23</b>	<b>100.0</b>
Personal Competencies	Physically healthy	3	4.8
	Safety and health	4	6.3



Themes	Codes	Analysis	
		Frequency	Percent
		N	%
	Uninfected	1	1.6
	Personal traits	2	3.2
	Human relations with students	11	17.5
	Students problem-solving	9	14.3
	Choosing words	5	7.9
	role model	8	12.7
	ideal	8	12.7
	passion	6	9.5
	sincere	2	3.2
	Problem solving skills	4	6.3
	<b>Total</b>	<b>63</b>	<b>100.0</b>

By reading the results in the previous table (20), it is confirming there is many of Professional Competencies which Necessary for Teachers of Applied Technology Schools (ATS) from the perspective of school leaders' opinions. Those Competencies reached (7) Competencies.

Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS) from schools leaders' opinions are: Planning Competencies, Teaching Competencies, Technological Competencies, Classroom Management Competencies, Assessment Competencies, Mastery of Specialization Competencies, and Personal Competencies.

Also, the previous table (20) confirm that Teaching Competencies was In first rank with number of frequencies reached (111) frequency, while Mastery of Specialization Competencies came in ranked last with number of frequencies reached (23) frequency.

In this regard, (S.M), manager of Imam Muhammad Metwally Al-Shaarawi School, pointed out that " the most important training needs lie in classroom management from a timing perspective, meaning time management. Some teachers require educational training, such as dealing with students in a systematic educational approach, due to the fact that the school has a significant percentage of teachers who are not education graduates ".

also (H.A.), manager of the Applied Technology School for Mechatronics in Bader City, said that "The teachers in our school can be divided into two types: the first type consists of education teachers who need additional training in communication skills. As for the second type, which includes contract-based appointed trainers, they require training in classroom management skills, lesson preparation, and student interaction. This is because they lack an educational background".

Ms. (S.S), manager of Electromisr School in El-Salam City, stated that "one of the most important training needs for the school's teachers is training on learning strategies, classroom management, problem-solving, multiple intelligences, and thinking methods, as well as dealing with individual differences among students".

Furthermore, Ms. (S.M), manager of Imam Mohammed Mutawalli Al-Sha'rawi School, added that one of the best common practices carried out by the teachers in the Applied Technology Schools in classroom management is "teachers reinforcing students' knowledge through repetition, dividing students into work groups, allowing them to discuss with each other, identifying their strengths and working on enhancing them, as well as identifying their weaknesses and developing improvement plans for them".

As Mr. (W.M), manager of Volkswagen School, stated, one of the best common practices carried out by the teachers in Applied Technology Schools in classroom management is "the active learning approach and diversifying instructional strategies within a single class, such as brainstorming, dialogue, discussion, and group work based on the lesson's needs".

Ms. (S.S), the manager of Electromisr School, highlighted that "Mr. Tarek (the mathematics teacher), and Miss Marwa are considered among her best teachers. Mr. Tarek is known as 'the magician' due to his highly advanced teaching skills. He is not only a teacher but also a trainer who occasionally coaches his colleagues to enhance their abilities. He is devoted to his work and has a strong rapport with the students, continuously following up on their progress.

He earned the title 'the magician' for his ability to control any class, regardless of its level. He is an unconventional teacher who explains concepts using various methods, presenting mathematics in the form of a story that captures the attention of all students. He can simplify any challenging content, always motivating and stimulating their drive. Additionally, he guides students through different levels of thinking until they reach the pinnacle of Bloom's taxonomy, which is creativity.

Miss Marwa also possesses highly advanced teaching skills and excels in classroom management. She can attract the attention of all students and keep them focused during her lessons. It is challenging to find a distracted or disinterested student while she is teaching. She works passionately for 5 hours daily and can solve problems independently without escalating them to the principal for resolution".

While Mr. (A.B), the manager of WE Applied Technology School in Nasr City, emphasized that "there are some areas where teachers receive low evaluations, which include: developing enrichment and remedial plans based on students' results, monitoring and assessing student work, identifying appropriate learning resources based on students' needs and subject requirements, utilizing learning resources, laboratories, workshops, and effective teaching techniques, as well as implementing in-class and out-of-class educational activities that focus on developing positive values and attitudes among students".

Ms. (S.S), manager of Electromisr School, affirmed that "in Electromisr School, teachers should focus on the behavioral aspect of students, as their specialization in electricity will require them to enter homes, hotels, companies, and other places in the future. Therefore, they must excel in dealing with the public. Teachers should be mindful of their words and behaviors and be extremely cautious in their interactions, as they serve as role models for students in ethics and conduct ".

Also, Mr. (H.A), manager of the Applied Technology School for Mechatronics in Badr City, added that "teachers should be characterized by conviction, adaptability to change, and a willingness to self-improvement. This can be linked to providing financial incentives to encourage teachers in their development. Last year, in collaboration with our industrial partner, we introduced a distinguished incentive for teachers who receive the highest evaluations, in addition to their regular salary. This motivated teachers to enhance their teaching performance, foster creativity and innovation in the educational process. It highlights the importance of providing both moral and financial support to teachers and students to achieve the best outcomes in the educational process".

Mr. (H.A), manager of the Applied Technology School for Mechatronics in Badr City, clarified that "the teachers at the school lack teaching skills. It is essential for teachers to diversify their learning strategies to reach the minds of all students in the classroom. Not only that, but there is also a lack of the concept of being a facilitator and a guide among the teachers. Some teachers may take on all the roles in the classroom, thinking that doing so means they are doing their job well. However, it is necessary to involve students in accessing information by themselves, and teachers should provide them with the keys to researching and seeking information".

Mr. (A.B), the manager of WE Applied Technology School in Nasr City, pointed out that "the teachers at the school lack effective student performance evaluation skills. They have a certain weakness in this aspect. Some teachers also face a problem in being unable to evaluate and address students' misbehavior in the classroom. When a student engages in certain disruptive behavior, the teacher is unable to handle and evaluate it

properly. Regarding evaluating knowledge and formulating questions, the school's training unit has conducted specific training courses in this context. However, despite that, the teachers at the school still struggle to create assessments at the required level".

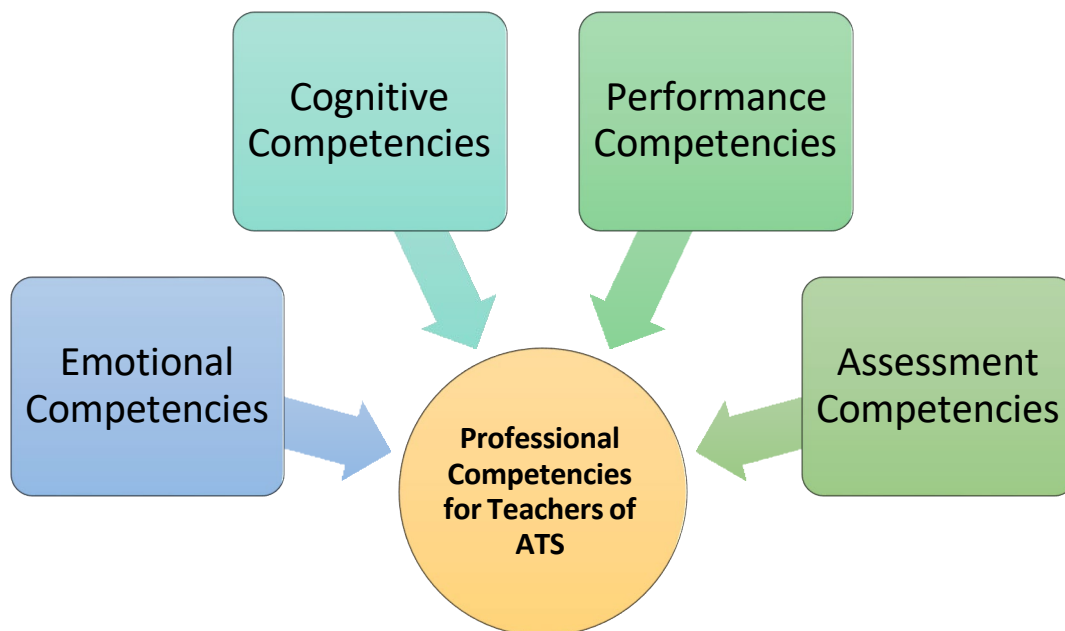
### **Results of Focus Group with Companies about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS):**

Where the results of the analysis of the interviews with industrial partner in the five schools included in the basic experiment revealed in-depth analyzes on how to improve the professional competencies of the teachers of applied technology schools, by identifying the most important training needs of the teachers of those schools, as well as highlighting the strengths and weaknesses of the teachers of those schools from schools industrial partners' opinions.

The results of the focus group were reached through the qualitative analysis of the in-depth and open interviews that took place with (5) industrial partners of applied technology schools, (1) industrial partner from each school, and the interviews were conducted with the industrial partners directly, and the duration of the interview ranged from (60) to (75) minutes. Through it, the researchers asked a set of questions, after explaining the objectives of the interview (and asking permission to record the interview, and the researchers pledged not to use it except for the purposes of scientific research).

**The following is a detailed presentation of the results reached after data collection and analysis, as follows:**

The industrial partners' opinions about the necessary competencies for the teachers of the Applied Technological Schools emanated from the existence of several competencies represented in a group of themes, as shown in the figure (27):



**The following are the findings:**

Table (21) shows the Themes and codes included in Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS) from industrial partners' opinions:

**Table 33: industrial partners' opinions about Necessary Professional Competencies**

Themes	Codes	Analysis	
		Frequency	Percent
		N	%
Emotional Competencies	Role model	8	12.3
	integrated personality	3	4.6
	Commitment to values	3	4.6
	Facilitator teacher	7	10.8
	Professional ethics	3	4.6
	positive attitudes	10	15.4
	Building an honorable person	2	3.1
	Professional values and ethics	5	7.7
	Commitment	4	6.2
	Respect the ethics of the labor market	2	3.1
	ethical standards	7	10.8
	good behaviours	3	4.6
	Good interpersonal skills	7	10.8
	Code of Ethics	1	1.5
<b>Total</b>	<b>65</b>	<b>100.0</b>	
Cognitive Competencies	Academically qualified	2	8.3
	Professionally qualified	2	8.3
	skilled developer	3	12.5
	Proficient in English	1	4.2
	Knowledge of educational concepts	2	8.3
	cultural awareness	3	12.5
	sustainable professional development	2	8.3
	Different personality types	4	16.7
	students' needs	3	12.5
	Discover distinguished and creative	2	8.3
<b>Total</b>	<b>24</b>	<b>100.0</b>	
Performance Competencies	Classroom management	3	7.0
	Time management skills	2	4.7
	Active learning	2	4.7
	Effective dialogue method	2	4.7
	different teaching strategies	3	7.0
	Various teaching methods	1	2.3
	technological skills	2	4.7
	Modern technology	1	2.3
	digital transformation	1	2.3
	Internet	1	2.3
	Projectors	1	2.3
Mind maps	1	2.3	

Themes	Codes	Analysis	
		Frequency	Percent
		N	%
	Plays	1	2.3
	Videos	1	2.3
	Individual differences consideration	4	9.3
	Use body language	1	2.3
	communication skills	3	7.0
	Presentation skills	1	2.3
	Teamwork	1	2.3
	Adding enjoyment	2	4.7
	Delivering information	3	7.0
	Competence	1	2.3
	Collaborative	1	2.3
	High skills	1	2.3
	Sharing experiences	1	2.3
	Multidirectional dialogue	2	4.7
<b>Total</b>	<b>43</b>	<b>100.0</b>	
Assessment Competencies	Assessment	2	16.7
	Evaluation	1	8.3
	Strengths	3	25.0
	Weaknesses	4	33.3
	Feedback	2	16.7
	<b>Total</b>	<b>12</b>	<b>100.0</b>

By reading the results in the previous table (21), it is confirmed there is many of Professional Competencies which Necessary for Teachers of Applied Technology Schools (ATS) from the perspective of industrial partners' opinions. Those Competencies reached (4) Competencies.

Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS) from industrial partners' opinions are: Emotional Competencies, Cognitive Competencies, Performance Competencies, and Assessment Competencies.

Also, the previous table (21) confirm that Emotional Competencies was in first rank with number of frequencies reached (65) frequency, while Assessment Competencies came in ranked last with number of frequencies reached (12) frequency.

When representatives of the industrial partner in schools were asked about the possibility of extracting teachers' competencies through their students' needs, (G.A.), the representative of the industrial partner at Imam Mutawalli Al-Sha'rawi School, pointed out that "the student can be treated as a client, and the teacher works to satisfy them. Therefore, students' needs are a fundamental factor in determining teachers' competencies, but they are not the only factor".

add (M.A.), the representative of the industrial partner at We School in Nasr City, added, "The feedback received by the teacher from the students is a fundamental factor in determining the teacher's training needs".

(M.L), the industrial partner at the Applied Technology School for Mechatronics in Bader City, has clarified that the key professional competencies a teacher in applied technology schools should possess are: "Effective classroom management, utilization of diverse teaching methods, proficient handling of modern technology, such as conducting online research, using email, and operating visual presentation tools, delivering information effectively, identifying and discovering exceptional, creative, and talented students, and appropriately harnessing their abilities".

Also, (AS), the industrial partner at Volkswagen School, has highlighted that the key professional competencies that teachers in applied technology schools should possess are: "Commitment, cultural awareness of the institution, the ability to work in a team, communication skills, presentation skills, active learning, assessment and evaluation, and sustainable professional development."

(M.F), the industrial partner at Electromisr School, has pointed out that the key professional competencies that teachers in applied technology schools should possess are: "The ability to make the educational process enjoyable, considering individual differences, language proficiency, being a role model and a facilitator for their students".

(M.F), the industrial partner at Electromisr School, has also added that "there is a problem with the lack of follow-up after the training process to assess whether the training has achieved the desired objectives in developing teachers' skills or not. Many teachers fail to apply what they have learned during the training inside the classroom with students. Therefore, continuous monitoring of the training's impact is necessary".

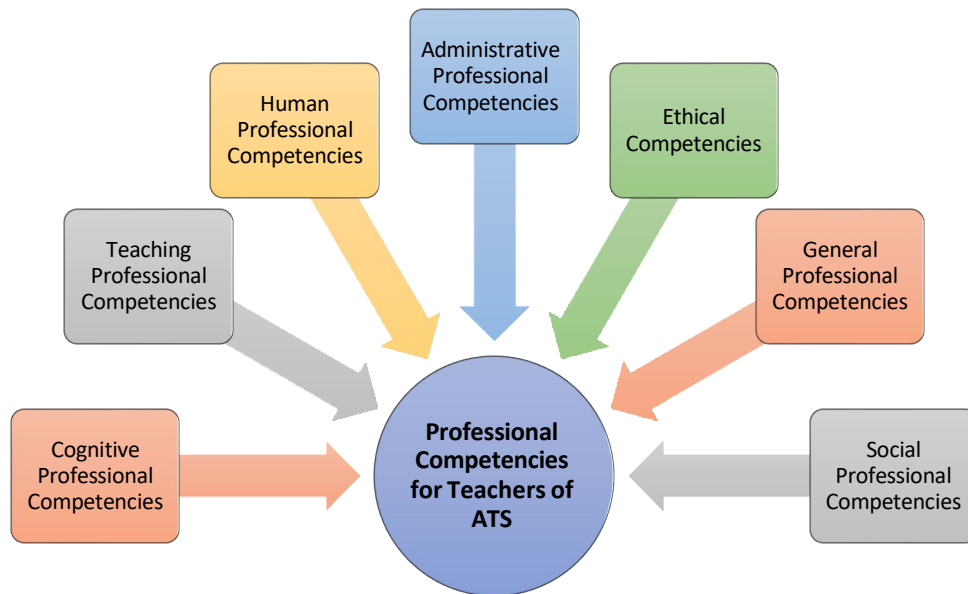
#### **Results of Focus Group with Parents about the Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS):**

Where the results of the analysis of the interviews with Parents in the five schools included in the basic experiment revealed in-depth analyzes on how to improve the professional competencies of the teachers of applied technology schools, by identifying the most important training needs of the teachers of those schools, as well as highlighting the strengths and weaknesses of the teachers of those schools from students Parents' opinions.

The results of the focus group were reached through the qualitative analysis of the in-depth and open interviews that took place with (50) Parents of applied technology schools, (10) Parents from each school, and the interviews were conducted with the industrial partners directly, and the duration of the interview ranged from (75) to (90) minutes. Through it, the researchers asked a set of questions, after explaining the objectives of the interview (and asking permission to record the interview, and the researchers pledged not to use it except for the purposes of scientific research).

#### **The following is a detailed presentation of the results reached after data collection and analysis, as follows:**

The students Parents' opinions about the necessary competencies for the teachers of the Applied Technological Schools emanated from the existence of several competencies represented in a group of themes, as shown in the figure (28):



The following are the findings:

Table (22) shows the Themes and codes included in Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS) from Students Parents' opinions:

**Table 34: students Parents' opinions about Necessary Professional Competencies**

Themes	Codes	Analysis	
		Frequency	Percent
		N	%
Cognitive Professional Competencies	Academic knowledge	9	17.3
	Educational experiences	2	3.8
	Academic experiences	3	5.8
	Proficient	7	13.5
	Strong knowledge	2	3.8
	creative	3	5.8
	cultured	3	5.8
	labor market requirements	1	1.9
	Age-related characteristics	2	3.8
	intellectual level of students	3	5.8
	Student's cognitive level	3	5.8
	Student's skill level	3	5.8
	Self-development	4	7.7
	Educational skills	2	3.8

Themes	Codes	Analysis	
		Frequency	Percent
		N	%
	Keeping up with the latest trends	1	1.9
	Adapting to technological advancements	2	3.8
	Information search skill	2	3.8
	<b>Total</b>	<b>52</b>	<b>100.0</b>
Teaching Professional Competencies	Student motivation	2	2.1
	Student comprehension	1	1.0
	Teaching skills	2	2.1
	Classroom management skills	2	2.1
	effective communication	5	5.2
	Diverse teaching methods	3	3.1
	Teamwork	2	2.1
	Collaborative work	2	2.1
	Effective performance skills	3	3.1
	Increasing activities	2	2.1
	Simplifying information	7	7.3
	Delivering information	9	9.4
	thinking skills	4	4.2
	Decision-making skills	2	2.1
	Different knowledge resources	3	3.1
	technological skills	5	5.2
	practical application	2	2.1
	Building student thinking	2	2.1
	Connecting to the environment	1	1.0
	Considering student level	2	2.1
	Reinforcing positive behavior	2	2.1
	Monitoring students	3	3.1
	Encouraging students	1	1.0
	Considering individual differences	13	13.5
	Asking questions	2	2.1
	Listening to students	2	2.1
	Continuous student assessment	5	5.2
	Addressing weaknesses	2	2.1
Providing feedback	1	1.0	
Developing improvement plans	2	2.1	
Teaching efficiency	2	2.1	
<b>Total</b>	<b>96</b>	<b>100.0</b>	
Human Professional Competencies	Building human relationships	30	10.2
	Building student personality	22	7.5
	Student self-confidence	9	3.1
	Emotional comfort	7	2.4



Themes	Codes	Analysis	
		Frequency	Percent
		N	%
	Boosting morale	3	1.0
	Student ethics	11	3.7
	Student behaviors	17	5.8
	Guiding students	5	1.7
	Counseling students	5	1.7
	Resolving student problems	18	6.1
	Encouraging students	4	1.4
	Providing psychological support to students	20	6.8
	The nurturing teacher	1	0.3
	The friendly teacher	1	0.3
	Advisor	6	2.0
	Facilitator	8	2.7
	Guide	5	1.7
	Role model	24	8.1
	Influence	5	1.7
	Change	3	1.0
	Emotional support	8	2.7
	Containment	3	1.0
	Leading by example	11	3.7
	Respecting the student	7	2.4
	Approach to dealing with students	19	6.4
	Supporting and containing students	3	1.0
	Continuous communication with students	7	2.4
	Providing advice	5	1.7
	Considering the psychological aspects of students	13	4.4
	Accepting students	4	1.4
	Collaborating with students	3	1.0
	Supportive of soft skills	1	0.3
	Supportive of responsibility	2	0.7
	Continuous student development	5	1.7
	<b>Total</b>	<b>295</b>	<b>100.0</b>
Administrative Professional Competencies	Communication with school administration	3	8.8
	Decision-maker	2	5.9
	Assisting colleagues	8	23.5
	Participation	15	44.1
	Participating in curriculum development	6	17.6

Themes	Codes	Analysis	
		Frequency	Percent
		N	%
	<b>Total</b>	<b>34</b>	<b>100.0</b>
Ethical Competencies	Ethical aspect	20	13.4
	Mindful of his words	13	8.7
	Seeking justice	9	6.0
	Firmness	11	7.4
	Professional behaviors and ethics	18	12.1
	Good behaviors	20	13.4
	Academic integrity	2	1.3
	Behavior modification	24	16.1
	Reinforcing positive behaviors	27	18.1
	Virtuous traits	5	3.4
	<b>Total</b>	<b>149</b>	<b>100.0</b>
General Professional Competencies	Good appearance	7	12.1
	Self-confident	11	19.0
	Psychologically qualified	15	25.9
	Passionate	8	13.8
	Enthusiastic	3	5.2
	Talented teacher	9	15.5
	Adaptable teacher	2	3.4
	Meticulous	3	5.2
	<b>Total</b>	<b>58</b>	<b>100.0</b>
Social Professional Competencies	Social	8	29.6
	Communicates with parents	13	48.1
	Awareness of community issues	4	14.8
	Future planning	2	7.4
	<b>Total</b>	<b>27</b>	<b>100.0</b>

By reading the results in the previous table (22), it is confirm there is many of Professional Competencies which Necessary for Teachers of Applied Technology Schools (ATS) from the perspective of Students Parents' opinions. Those Competencies reached (7) Competencies.

Necessary Professional Competencies for Teachers of Applied Technology Schools (ATS) from Students Parents' opinions are: Cognitive Professional Competencies, Teaching Professional Competencies, Human Professional Competencies, Administrative Professional Competencies, Ethical Competencies, General Professional Competencies, and Social Professional Competencies.

Also, the previous table (22) confirm that Human Professional Competencies was in first rank with number of frequencies reached (295) frequency, while Social Professional Competencies came in ranked last with number of frequencies reached (27) frequency.

In this regard, (Sh.A), the parent of the student Nermin at We School in Nasr City, pointed out that "a successful teacher is capable of influencing and positively changing the student's personality. They also work

on developing the student's self-confidence, which motivates them to contribute to making a positive change in society".

Meanwhile, (W.A), the parent of the student Osama at We School in Nasr City, said, "A successful teacher is one who is knowledgeable in academic matters. An effective teacher is one who possesses effective performance skills, which include academic and educational experiences that positively influence the students. Moreover, a successful teacher is capable of connecting with the students and building good human relationships with them".

Additionally, (A.B), the parent of the student Sonds at Imam Mohamed Metwally Al-Shaarawi School, added that some characteristics of a successful teacher are "being well-versed in the subject matter and having a higher level of intellectual capability than the students. The teacher should be able to contain and handle these students effectively and also possess a firm personality".

Moreover, (M.N), the parent of the student Adham at the Applied Technology for Mechatronics School in Badr City, emphasized that "the teacher should be proficient in the subject matter and capable of effectively delivering the information. Additionally, they should consider the characteristics of the age group they are dealing with and focus on the educational, ethical, and behavioral aspects of the students. The teacher should instill in them positive behaviors and values, continuously ensuring that the information reaches the students, and consistently following up with and guiding them".

(M.A), the parent of the student Ryan at Volkswagen School, clarified that "a strong relationship between the teacher and the students, based on trust and emotional comfort for the student, makes the student feel reassured and comfortable. This, in turn, makes the student develop a fondness for the subject and the teacher. If the student loves the teacher, they will exert great effort to please the teacher and make them happy. He mentioned that he found this in the teachers at Volkswagen School, as they instilled confidence in his son and worked with him with warmth and brotherhood, which had a positive impact on the student's personality and academic performance".

As (S.R), the parent of the student Abdulwahab at Electromisr School, stated, "The teacher can make the student love the subject by establishing effective communication with them, simplifying the information, adapting it to the student's level, and considering individual differences".

In this regard, (S.S), the parent of the student Hassan at Electromisr School, narrated that "she encountered a problem when the subject teacher was unable to effectively deliver the information. Instead, the teacher read directly from the textbook without explaining or simplifying the content. Consequently, the school administration promptly replaced the teacher with a more qualified one the next day".

When (M.S), the parent of the student Shahd at Volkswagen School, was asked about the characteristics of the best and worst teachers in applied technology schools from her perspective, she indicated that "the best teacher is the one who is committed and interacts with students without fear or anxiety. On the other hand, the worst teacher is the one who uses a single teaching method and does not vary the teaching approaches to accommodate the individual differences of students. Sometimes, students who do not understand the teacher's explanation may end up feeling that the problem lies with them rather than the teacher".

### Discuss Results

The process of identifying training needs to improve the professional competence of teachers in applied schools of technology is important and necessary from the point of view of school leaders, industrial partners and parents. The whole process – framing the key concepts, gather and analyse the data - points towards the following themes, that need to pay attention in the development of teacher education:

- ❖ **Improving the quality of education:** Improving the competence of teachers contributes to improving the quality of education provided to students. When teachers have the necessary skills and knowledge, they can implement effective instructional strategies and use modern teaching tools and resources to better support student learning.
- ❖ **Addressing Industry and Labour Market Needs:** As employers, Industry Partners can talk about the skills and knowledge teachers need to develop and advance in the labour market.
- ❖ **Facilitate Communication and Collaboration:** Identifying training needs helps facilitate communication and collaboration between school leaders, industry partners, and parents. These parties can participate in identifying areas of focus and improvement, and exchange ideas and knowledge on how to enhance a teacher's professional competence. This joint collaboration fosters partnerships between the school and the community to better achieve educational goals.
- ❖ **Meeting the needs of students and parents:** Improving the ability of teachers directly affects the learning experience of students. When teachers possess the necessary skills and knowledge, they can meet the diverse needs of students and provide a stimulating and supportive learning environment. This helps to increase parental satisfaction with the quality of education and trust in schools and teachers.

Determining the training needs in order to raise the professional competence of teachers in applied technology schools from the point of view of school leaders and industry partners as well as parents in a comprehensive manner contributes to satisfying everyone and achieving better educational goals.

#### **Recommendations for improving teachers' professional competence in Applied Technology Schools (ATS):**

- **Improving technology Competence:** teachers in Applied Technology Schools must have a background in technology and be skilled in the appropriate technical abilities required in their teaching.
- **Developing Pedagogical abilities:** Teachers must effective teaching approaches and teaching methods in teaching their students. They must be able to deal with various learning styles of students.
- **Promoting Adaptability and flexibility:** Teachers' teaching methods must be versatile and flexible. To address the changing requirements of students, they should be open to embracing new technology and instructional approaches.
- **Improve Communication and Collaboration Skills:** Effective communication skills are required for teachers in Applied Technology Schools since they must communicate complicated technical topics to students in a straightforward and intelligible manner. Collaborations with coworkers, industry professionals, and other stakeholders can further improve the learning experience and give students with significant networking possibilities.
- **Encourage problem-solving and critical thinking skills:** Encouraging teachers to study and evaluate various solutions can help them think critically and creatively. This will have an impact on their students.
- **Assessment and Feedback:** Teachers should devise effective assessment techniques for assessing students' comprehension. Giving constructive comments on time can assist students in improving their skills and knowledge. To fully assess students' ability, assessments should incorporate both theoretical and practical components.
- **Student-centered approach:** Teachers should take a student-centered approach to their instruction, adapting it to the specific needs and interests of their students. This includes identifying and comprehending various learning styles, strengths, and shortcomings.

By focusing on improving teachers' professional competence in Applied Technology Schools (ATS), teachers can successfully prepare students for the demands of the modern workforce and assist them to succeed in their studies.

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