

**VOCATIONAL HIGHER SECONDARY
SECOND YEAR**

**FISH PROCESSING
TECHNOLOGY**

TEACHERS' SOURCEBOOK



**GOVERNMENT OF KERALA
Department of Education**

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State Council of Educational Research & Training
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Preface



Dear Teachers,

In the context of the changing scenario in the field of education, the role of the teacher is not simply teaching the syllabi. The emerging needs of education calls for a facilitator's role from the teachers. The learning process has to be student centred and activity- based. Learning activities must enable the student to develop process domain and multiple intelligence skills to their maximum extent.

This sourcebook has been written primarily for the benefit of teachers who teach **Fish Processing Technology** at Vocational Higher Secondary level. The subject matter has been dealt with in such a way as to enable the teacher to provide suitable learning activities for effective learning. The success of the approach depends upon the vision and commitment of the teacher. It is also expected that the teacher has to seek help from other sources like reference books from libraries, websites etc.

Hope that this sourcebook will help the teacher to develop the skills and experience required for effective classroom transaction.

With regards,

Thiruvananthapuram

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July. 2006

Director SCERT, Kerala

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GENERAL APPROACH

SIGNIFICANCE OF VOCATIONAL EDUCATION

The ultimate aim of education is human refinement. Education should enable the learner to formulate a positive outlook towards life and to accept a stand, which suits the well being of the society and the individual as well.

The attitude and potential 'to work' has determined the destiny, progress and cultural development of the human race. The objective of education is to form a society with individuals having a positive work culture. The educational process expected in and outside our formal schools should concentrate upon inculcating concepts, abilities, attitudes and values in tune with this work culture. Hence vocational education cannot be isolated from the main stream of education. In another sense, every educational process should be vocational. However our inability to utilize the resources wisely and scarcity of job opportunities are a severe issues of the present society. For overcoming this deep crisis, emergent techniques has to be sorted out and appropriate research have to be seriously carried out. It is in this sense that the content and methodology of Vocational Higher Secondary Education have to be approached. The need for meaningful linkages between the world of work and world of education is well recognized. The essence of the recommendations made by various commissions and committees is that vocationalisation should be the main feature of the future system of education at the higher secondary stage; it can be extended to school level also. Vocational education intends to create various skills in different occupations comprising several areas of activities.

The Vocational Higher Secondary Course was envisaged as a part of the National Policy on Education with the noble idea of securing a job along with education. The relevance of vocational education is very great in this age of

unemployment. This education system, which ensures a job along with higher education, stands aloof from other systems of education.

This education imparts the life skills required by the youth to enter the world of work and assume the responsibilities of adulthood. As per the expert meeting report (2001) of UNESCO, the life skills are grouped under 4 categories.

They are

1. Skills for personal fulfillment
2. Skills for living in society
3. Skills for dealing with changing economies
4. Skills for dealing with changing work patterns.

Vocational Education ensures fulfillment of manpower requirement or national development and for social security of the citizens through self-employment. It also helps to reduce the migration of rural youth to urban areas and thus helps in rural development.

The learners of Vocational Education get an opportunity to avail one year apprenticeship training in industries to improve their practical skill. During the course of study, on the job training (OJT) for 10 days in a year is arranged to improve the skill and efficiency of the learner. This education system motivates the attitude towards self-employment through Production Cum Service Training Centers. (PSTC)

OBJECTIVES OF VOCATIONAL EDUCATION

The National policy on education has accorded very high priority to the program of vocationalisation of education, considering the following objectives.

- ❑ To fulfill national goals of development and eradication of unemployment and poverty.
- ❑ To impart education relevant to increased production and productivity, economic development and individual prosperity.

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- ❑ To make available skilled work force at all levels to alleviate the rural unemployment and for the development of nation.
 - ❑ To develop environmental awareness to ensure sustainable development.
 - ❑ To develop vocational aptitude, work culture, values and attitudes of the learners so as to enrich the productivity of the nation.
 - ❑ To develop entrepreneurial competencies and skills of learners for self-reliance and to undertake gainful self-employment.
 - ❑ To facilitate the expansion of higher education and explore future opportunities through innovative guidance and programmes.
 - ❑ To develop vocational competencies, creative thinking in the related areas and facilitate training.
 - ❑ To create awareness on mental, physical and social health.
 - ❑ To acquire awareness about different job areas and to provide backgrounds for obtaining higher level training in subjects concerned.

LEARNING

Learning is construction of knowledge through a continuous mental process. It is advancement through adding and correcting by comparing the new issue with the previously learned concepts. Learning is an intellectual process rather than mere memorization of facts. Learning is a conglomeration of a variety of activities like problem solving, finding out co-relations, prediction, arriving at conclusions, rational as well as critical thinking, finding applications, grouping for other possibilities. When opportunities are provided for intellectual processes learning will become effective and intellectual ability will get strengthened.

Theoretical foundations of learning

Education is the best device that can be adopted for creation of a new society. It should be democratic in content and process and should acknowledge the rights of the learner. It should also provide opportunity for better citizenship training. The concept of equality at all areas should get recognition in theory and

practice. There should be a planned programme of action to develop nationality, humanness and love against the encroachment of sectarianism of caste and religion. The learner should become cognizant of the implications of privatization, liberalization, globalization etc.

They should develop the potential to use the acquired learning as a liberative weapon.. They should be able to view education and life through the perspective of social well being. A basic awareness of all the subjects needed for life is essential for all students.

The impact of perspectives formed in us during the colonial period still reflects in our educational philosophy. The solution to the present day perplexities of the society, which exposes education on the basis of competitions and marketisation, is only a comprehensive view of life.

It is high time that education is reorganized on the basis of the philosophy of human education. The human approach to education has to reflect in its content, learning process and outlook. The perspective of 'learning to be' and 'learning to live together' as expressed by the UNESCO and the concepts of existential, interpersonal and intrapersonal intelligence.

The basis of new approaches to curriculum and teaching- learning process are the developments that took place in the eastern and western of the worlds.

When we plant the learner at the center of the learning process, the teaching process has to be changed accordingly. It is the result of the rapid growth and development of Science and Technology and Pedagogy. If we want to undergo the changing process, we have to imbibe the modern hypothesis regarding learner. They have;

- ❑ Great curiosity
- ❑ Good imagination
- ❑ Numerous other qualities and interests
- ❑ Individuality

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- ❑ Interest in thinking and working in a free and fearless atmosphere.
 - ❑ Interest in enquiring and questioning.
 - ❑ Ability to draw conclusions after logical thinking.
 - ❑ Ability to express and establish freely the conclusions arrived at.
 - ❑ Interest for recognition in the society.
 - ❑ Determination to face the interference of society and make components which is a part of social life.

When we consider the learning system, the domain to be stressed in education according to the modern development becomes relevant. The knowledge domain consists of

- ❑ Facts
- ❑ Ideas
- ❑ Laws
- ❑ The temporary conclusions and principles used presently by scientists.

Learning is a process. The continuous procedures we undergo to reach a particular goal can be called process. The skills that are parts of the process to analyze the collected ideas and proofs and come to a conclusion is called process skills. Some important **process skills** are,

- ❑ To observe
- ❑ To collect data and record
- ❑ To classify
- ❑ To measure and prepare charts
- ❑ To experiment
- ❑ To predict
- ❑ To recognize and control the variables
- ❑ To raise questions

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- ❑ To generalize
 - ❑ To form a hypothesis and check.
 - ❑ To conclude
 - ❑ To communicate
 - ❑ To predict and infer
 - ❑ To use tools.

Observation is the process of acquiring knowledge through the senses. It is purely objective oriented. Learning experiences, which provide the opportunities to use all the senses.

The process of grouping is known as classifying. Starting from simple groupings of data, it can extend to the level of classification into minute sub-groups.

In addition to this, consider the skills related to creative domain also, they are skills:

- ❑ To visualize
- ❑ To connect facts and ideas in new ways.
- ❑ To find out new and uncommon uses of objects
- ❑ To fantasize
- ❑ To dream
- ❑ To develop creative isolated thoughts

Creativity is an essential component of process and activities. The element of creativity is involved in finding out problems, formation of hypothesis, finding 'solutions' to problems etc. Through activity oriented learning experiences, opportunities to express creativity can be created.

Again, the following factors included in the ***Attitudinal domain*** deserve special mention.

- ❑ Self-confidence
- ❑ Love for scientific knowledge

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- ❑ Attitude to know and value history
 - ❑ Respect human emotions
 - ❑ Decide with reasonable present problems
 - ❑ Take logical decisions regarding personal values

'Hypothesis' is a temporary conclusion drawn using insight. Based on knowledge and experiences relating to the problems the causes and solutions can be guessed.

As regards the **application domain** the important factors are the ability to:

- ❑ observe in daily life examples of ideas acquired.
- ❑ take the help of scientific process to solve the problems of daily life.
- ❑ choose a scientific life style
- ❑ connect the ideas acquired with other subjects.
- ❑ integrate the subjects with other subjects.

Some basic stands have to be taken on the new scientific knowledge about intelligence learning and teaching. When such basic concepts are accepted changes are required in the following factors.

- ❑ The vision, approach, structure and content of the curriculum.
- ❑ The vision, approach, structure and content of the textbooks.
- ❑ Role of the teacher and the learner.
- ❑ Learner atmosphere, learning materials and learning techniques.

Some scientific perspectives accepted by modern world in educational psychology are given below.

Constructivism

This approach points out the concept that the learner constructs knowledge. New knowledge is constructed when ideas are examined and practiced in new

situations relating them with the previously acquired knowledge and experience. That is assimilated into the cognitive structure of one's knowledge. This method, which gives priority to critical thinking and problem solving, provides opportunity for self-motivated learning.

Social Constructivism

Social constructivism is a sub section of constructivism. Knowledge is formed, spread and imbibed and it becomes relevant in a social environment. Interactive learning, group learning, co-operative participatory learning, all these are concepts put forward by social constructivism.

The main propounders of constructivism are Piaget, Vygotsky and Bruner.

Discovery learning and interactive learning have prime importance. Learning takes place as a part of the attempt for problem solving. The activities of a learner who confronts cognitive disequilibria in a learning situation when he tries to overcome it leads to the renewal of cognitive structure. It is through this process construction of new knowledge and the assimilation of them takes place. Observation and enquiry are unavoidable factors. The learner advances towards new areas of acquisition of knowledge where he tries to compare his new findings with the existing concepts.

Learning is a live mental process rather than the ability for memorization of facts. Cognitive process has to be given emphasis. The process of problem analysis, elucidation, critical thinking, rational thinking, finding out co-relation, prediction, hypothesis formation, application, probing for other possibilities, extracting the crux and other processes are of critical importance in learning.

Constructivism gives greater predominance to co-operative learning. Social and cultural factors influence learning. Sharing of knowledge and experience among learners, collective enquiry, assessment and improvement, group activity and collaborative learning by sharing responsibilities with the objective of public activity, provide opportunity for effective learning.

In learning internal motivation is more important than external motivation. The learner should have interest and initiative in learning. Learning situation should be capable of forming a sense of ownership in the learner regarding the learning process.

Learning is not a linear process. It progresses in a spiraled way advancing deeper and wider.

NEW CONCEPTS OF LEARNING

1. Discovery Learning

The teacher has to create a motivating atmosphere for the learner to discover concepts and facts, instead of listening always. Creating occasion to progress towards discovery is preferred. Instead of telling everything before and compelling to initiate the models, situations are to be created to help the children act models as themselves.

2. Learning by discussion

Discussion leads to learning is Burner's theory. Here discussion is sharing on the plane of ideas. New ideas are arrived at by seeking explanations, by mutual giving and taking of ideas and by problem solving.

3. Problem solving and learning

Only when the learner feels that some thing is a problem to be solved that he takes the responsibility of learning it. It is an inborn tendency to act to solve a problem that causes cognitive disequilibrium in a particular area. It is also needed to have confidence that one is capable of doing it. The problems are to be presented in consideration of the ability and level of attainment of the learner.

4. Collaborative learning

This is the learning in which the responsibilities are distributed among the members of the group keeping common learning objectives. The common responsibility of the group will be successful only if each member discharges his duties. All the members will reach a stage of sharing the result of learning, equally through the activity with mutual understanding. The teachers who arrange collaborative learning will have to make clear the responsibilities to be discharged. This is possible through the discussion with the learners. Collaborative learning will help to avoid the situations of one person working for the whole group.

5. Co-operative learning

This is the learning in which the learners help one another. Those who have more knowledge, experience and competency, will help others. By this exchange of resources the learners develop a plane of social system in learning also. As there are no high ups and low ones according to status among the learners they can ask the fellow students doubts and without any hesitation. Care should be taken not to lead this seeking of help to mechanical copying. It should be on the basis of actual needs. So even while encouraging this exchange of ideas, among the members of the group cautious acceptance is to be observed as a convention. There should be an understanding that satisfactory responses should come from each member and that the achievement of the group will be assessed on the basis of the achievement of all the members.

6 Zone of Proximal Development

Vygotsky observes that there is a stage of achievement where a learner can reach by himself and another higher zone where he can reach with the help of his teachers and peers and elders. Even though some can fulfill the learning activity by them there is the possibility of a higher excellence. If appropriate help is forth covering every learner can better himself.

7 Scaffolding

It is natural that the learner may not be able to complete his work, if he does not get support at the proper time. The learner may require the help of the teacher in several learning activities. Here helping means to make the learner complete the activity taking responsibility by himself. The teacher has to keep in mind the objective of enabling the learner to take the responsibility and to make it successful.

8. Learning - an active mental process

Learning being a cognitive process, the teacher needs to know cognitive processes to facilitate the creation of learning opportunities. Learning can be made effective by providing learning experiences involving mental processes like

- Retrieves/recollects/retells information
- Readily makes connections to new information based on past experiences and formulates initial ideas /concepts.
- Detects similarities and differences
- Classifies/categories/organizes information approximately.
- Translates/transfer knowledge or understanding and applies them in a new situation.
- Establishes cause-effect relationships
- Makes connections/relates prior knowledge to new information/applies reasoning and draw inferences
- Communicates knowledge/understanding through different media.
- Imagines/fantasises/designs/predicts based on received information
- Judges /appraises/evaluates the merits or demerits of an idea/develops own solutions to a problem.

9. Intrinsic Motivation

Intrinsic motivation is given more importance than extrinsic motivation. The teacher has to arouse the internal motivation of the learner. A person internally motivated alone can immerse in learning and own its responsibility.

10. Multiple Intelligence

The theory of multiple intelligence put forward by Howard Gardener has created a turning point in the field of education. The National curriculum documents has recommended that the curriculum is to be designed taking into consideration this theory. Main factors of the intellect:

1. **Verbal/linguistic intelligence**- Ability to read and write, making linguistic creation, ability to lecture competence to effective communication, all these come under the this. This can be developed by engaging in language games and by teaching others.
2. **Logical/mathematical intelligence** - Thinking rationally with causes and effect relation and finding out patterns and relations come under this area. Finding out relations, explaining things, sequential and arithmetical calculations etc. are capable of developing this area of intelligence.
3. **Visual/spatial intelligence** - In those who are able to visualize models and bringing what is in the imagination into visual form and in philosophers, designers and sculptors this area of intelligence is developed. The activities like modeling using clay and pulp, making of art equipments, culture and giving illustrations to stories can help the development of this ability.
4. **Bodily Kinaesthetic Intelligence** - The activities using body language come under this. This area of intelligence is more developed in dancers and actors who are able to express ideas through body movements and in experts in sports, gymnastics etc.
5. **Musical Intelligence** - This is an area of intelligence, which is highly develop0ed in those who are able to recognize the different elements of

music in musicians and in those who can hear and enjoy songs. Playing musical instruments imitating the songs of musicians, listening silently to the rhymes and activities like this are capable of developing this area of intelligence.

- 6. Interpersonal Intelligence** - Those in whom this area is developed show qualities of leadership and behave with others in a manner. They are capable of understanding the thought of others and carrying on activities like discussion successfully.
- 7. Intra-personal Intelligence** - This is the ability to understand oneself. These people can recognize their own abilities and disabilities. Writing diaries truthfully and in an analyzing way and assessing the ideas and activities of others will help developing these areas of intelligence
- 8. Naturalistic Intelligence**- A great interest in the flora and fauna of the nature, love towards fellow beings interest in spiritual and natural factors will be capable of developing this area.
- 9. Existential Intelligence** - The ability to see and distinguish our own existence as a part of the universe, ability to distinguish the meaning and meaninglessness of life, the ability to realize the ultimate nature of mental and physical existences, all these are the peculiarities of this faculty of intelligence.

EMOTIONAL QUOTIENT

The concept of emotional intelligence put forward by Daniel Golman was used in framing the new curriculum. The fact that one's Emotional Quotient (E.Q) is the greatest factor affecting success in life is now widely accepted. The teacher who aims to focus on improving the emotional intelligence of students needs to concentrate on the following.

i) Ability to take decisions

Rather than imposing decision on students while planning and executing activities, the students may be allowed to take part in the decision making process. Taking decisions through open discussion in the class, inviting students suggestions on common problems etc. are habits to be cultivated.

ii) Ability to reach consensus

- When different opinions, ideas and positions arise, the students may be given the responsibility to reach a consensus.
- Imagining what would be the course of action in some situations, allowing to intervene in a healthy way in problems between individuals.

iii) Problemsolving

- Developing the idea that there is reason and solution to any problem.
- Training in finding reasons for problems.
- Suggesting solutions through individual or group efforts.
- Discussing social problems.
- Analyzing the shortcomings in methods to solve problems.

Whether plastic can be banned within school premises can be given as a problem. Group discussion will provide reasons and solutions. Problems, which can influence classroom learning and for which the learner can actively contribute

Solutions need to be posed

- Self criticism, evaluation
- Ability to face problem-situation in life
- Thinking what one would do if placed in the situation of others, how one would respond to certain experiences of others - All these foster the growth of emotional intelligence.

iv) Life skills

Life skills need to be given a prominent place in education. W.H.O. has listed: skills required for-success in life.

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- Self awareness
 - Empathy
 - Inter personal relations
 - Communication
 - Critical thinking
 - Creative thinking
 - Decision making
 - Problem solving
 - Coping with emotion
 - Coping with stress
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The new curriculum addresses these areas.

Knowing the characteristics of the learner, role of the teacher and how to use the teacher's handbook help the teacher to plan and effectively implement learning activities.

ROLE OF A TEACHER

In the earlier approach the teacher was mainly depending on the lecture method for teaching. But in the new method of education the student centered approach is given more importance than the teacher centered approach. Under this changed scenario the teacher has to perform the following roles in the classroom.

The teacher should be

- A facilitator of learning
- A guide to the overall development of the student
- A good observer and motivator

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- Able to consider the activities, needs, special features and age group of students at higher secondary level.
 - Able to understand the limitations of learner and their learning problems.
 - An instructional material developers
 - A good communicator
 - An innovator
 - Able to raise leadership qualities and self confidence of the learner
 - An authoritarian in the concerned subject
 - Able to arrest and sustain the attention of the learner
 - Able to bring out and encourage the inborn talents.
 - A resource person to ensure the optimum utilization of resources.
 - A systematic record keeper
 - A controller to issue guidance to the students
 - A person with high level of practical competency
 - Able to correlate area of study with familiar environmental situations
 - A self evaluator and good listener
 - Able to create awareness in social problems
 - A person with democratic and humanitarian approach
 - A professional as well as a philosopher
 - A good evaluator
 - A good organizer and a friend.
 - A co-learner as well as co-researcher
 - Able to give assistance and advice in placement needs and self employment by giving moral and technical support
 - Able to keep moral values

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- A person equipped with skill for using new techniques of learning
 - Optimistic and impartial

CHILD FRIENDLY CLASS ROOM ATMOSPHERE

Learning can be effective and enjoyable only when the class atmosphere is according to the new conception of learning and the characteristics of higher secondary learner.

- Class and seating are arranged in an attractive way
- Democratic nature is upheld
- Always active
- Students interact with teachers without fear
- Opportunity for a variety of activities
- Students allowed to involve interesting group activities
- Learning speed, learning style and differencing levels of attitudes are considered. Help is extended whenever needed.
- Sufficient instructional materials are available
- There is freedom of expression, students share their ideas and experiences
- Students are given acceptance and encouragement
- Healthy atmosphere
- Needs of each student is given consideration. Happy and energetic atmosphere
- Teachers work considering the rights of students
- Problems handled in a patient way
- Teachers look at all events from the student's view point

There will be students of various ability levels in any class because learning style, learning speed, varying exposure to language experiences, physical and psychological problems and varying socio-cultural background.

The learning experiences provided must help to bring the low activities to an expected level and extend the breadth and depth of the skills of the high activities.

By repeating experiences, introducing variations in a learning experience to suit different levels and if needed, formulating additional experiences the problem of varying ability levels can be tackled.

LEARNER

The learner in second year has undergone a learner centered and process oriented learning experience up to first year. The learner at this age is in an awakening stage and he is enthusiastic about environment. He needs recognition and encouragement from environment and also recognizes as a grown up man. He is adequately competent to select vocational subjects according to his aptitude and interact and to acquire higher education and profession as he wishes. The aspiration about future life is framed in this particular age for seeming national and international job opportunities. Some of the peculiarities of learner at this stage are;

- Physical, intellectual and emotional planes are intensive changes during the age and their reflections can be observed
- Ability to enquire, discover and establish cause-effect relationships between phenomena
- Readiness to undertake challenges
- Capacity to shoulder leadership roles
- Attempt to interpret oneself
- Susceptibility to different pressures
- Doubts, anxieties and eagerness about sex

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- Imaging for social recognition
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NEEDS OF LEARNER

- To make acquaintance with a job or self employment through vocational education
- To acquire more knowledge in the concerned area through higher education
- To recognize and encourage the peculiar personality of the later adolescent period
- To enable him to defined against the unfavorable circumstances without any help

ROLE OF LEARNER

- Active participant in the learning process
- Act as a researcher
- Sharer of information
- Sharer of responsibilities
- Collect information
- Takes leadership
- Involves in group work
- Act as a co-participant
- Observes his environment
- Experiments and realize
- Make interpretations and draw inferences
- Mould himself in to an active contributor for the welfare of the society

EVALUATION

In vocational higher secondary education, a new approach to education and evaluation should be made. Evaluation must be a systematic and continuous process. As the curriculum is based on vocational stream, capacity building is a most important part and it should be evaluated accordingly. The technical skills, interest in the particular field, communication skill, analysis organizing and presentation skills etc have to be evaluated. The personal and social qualities also have to be evaluated. Therefore, evaluation should be transparent, continuous and comprehensive.

SUPPORTING SYSTEM

In learner centered vocational education, a learning methodology has to be organized and a proper learning atmosphere is to be provided. Many organizations can support the learning activity. They are: -

1 School Resource Group (SRG)

Comprising all teachers (vocational and non vocational) instructors, and lab assistants with academic head as the group leader.

2 School support Group (SSG)

Comprising PTA president, members of local bodies, members of social clubs, subject experts etc who can contribute guidance /technology /infrastructure / financial assistance etc.

3 Parent Teacher Association (PTA)

Can provide adequate funds for field trips, production cum training centers (PCTC), exhibition, On Job training (OJT) etc.

4. Local bodies

Grama Panchayat, district panchayat and block panchayat can provide infrastructure ie, class rooms, laboratory, library, seminar hall, audiovisual

equipment etc.

5 Subjectclub

All vocational teachers handling same vocational subjects should form a subject at regional level or district level. This will help to share the knowledge and practical facilities, production and marketing of materials, service etc.

- Based on the excellency, district wise nodal schools may be selected to provide facilities like central library, museums, video conferencing etc.

6 Institution Industry Interaction Project (IIIP)

This should be implemented in every institution to update knowledge this also helps for OJT, PSTC and field visit.

MONITORING SYSTEM

Education is a kind of journey from darkness to light satisfying the needs and the wants of the individual and the society. The modernization of education through activity-oriented system enhances freethinking and working in a fearless atmosphere. It is a qualitative process not a quantitative one this necessitates a proper monitoring system. The system of monitoring should have the following features.

1. It must be transparent
2. It must enrich the ideas of the facilitator through innovative process
3. It must be time bound and rational
4. It must motive the facilitator to adopt new strategies
5. It must be recorded and ensure effective feedback for the effective monitoring of the system, three levels of the mechanism should be setup.
 - School level monitoring group
 - Regional level monitoring group
 - State level monitoring group

Moreover a social auditing system is advisable to attain the objective effectively.

FEATURES OF LEARNING PROCESS IN THE NEW SYSTEM OF EDUCATION

In the new system of education the learning process should be modified in such a way as to enable the learner to construct the knowledge of his own through observation, co-operation, problem solving, social interaction etc. The learning process should consider the nature ability, social setup, inborn talents and subject selected by the learner. Therefore the learning process should be,

- A continuous mental process
- Simple learner must feel that he is able to undertake the task
- Enable the learner to attain the curriculum objective
- Interesting
- Suitable to the age and attitude of the learner
- Future possibilities
- Enable group activity
- Challenging
- Time bound
- Constructive and curiosity developing
- Possibilities for evaluation
- Capacity to generate independent thinking
- Ability to enquire discovers and establishes cause effect relationship between phenomena.

LEARNING AIDS

To make the teaching and learning process simple and effective, certain learning aids and necessary use of such aids are transacting a complex idea makes the classroom live and students get more and more involved. The advances in

science and technology may be effectively utilized for this purpose. Some of the learning aids listed below.

- Multimedia
- Over Head Projector
- Computer
- Internet
- Liquid Crystal display Projector
- TV, VCD, DVD and tape recorders
- Working models
- Charts
- Slides
- Video Conferencing facility
- Library
- Text book
- Source book

SOCIETY

The new educational policy uplifts the social commitment of the learner. Therefore the society can also give some valuable contributions in this changing situation. The new system also ensures that the learner can perform certain useful services for the betterment of society. The social obligations can be illustrated as follows.

- To enrich social values, aptitude and ability in learner
- To develop entrepreneurial aptitude and ability which helps social welfare and self employment
- New system of education adopts OJT, PSTC etc is a part of vocational curriculum, which helps to make close contact with the society.

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- The resources available from our society can be positively utilized to convene seminars, interview etc.
 - Social organizations can help learners to make their education socially committed.
 - The social clubs like NSS, Tourism club, CDO club, energy club etc functioning in schools can make direct link with the society.
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FISHERIES APPROACH

Man has constantly been trying to explore the universe for providing himself with food, clothing and housing. These days the problems of food have become very drastic and it is being felt that supplementing agriculture could develop the main weapon in war on hunger. Fisheries is one of the important allied activities of agriculture sector. It is regarded as a powerful income and employment generator as it stimulates the growth of a number of subsidiary industries. This is also a foreign exchange earner besides providing balance protein food to all classes of people.

India possesses ideal conditions for improvement of fisheries. In spite of various advantages of fish as a valuable source of food, its availability is rather restricted in India on account of limited fishing industry. Till recently fishing and allied activities were restricted with certain sector of population. Boats, nets and tackles are what were devised centuries ago and are made by hands while other countries have marched much ahead with modern techniques. Organization of fishing industry on modern line will go a long way in solving the food problem in the country and improving the lot of the fishermen who constitute a significant part of India's population.

One of the important objective of fisheries development has been improvement of economic condition of fishermen who are the prime producers. One of the best ways to uplift the fisher folk is to eradicate illiteracy and to give awareness about new techniques developed in fishing and allied industries.

Today fisheries have been incorporated in our education system as a subject at various levels. Our approach is to teach fisheries as a vocational subject to transfer the scientific and technical know how to learners, which will empower them to transfer the knowledge to fisheries sector and modernize it. A diverse range of methods have been evolve to preserve a wide range of fish species in different parts of the world. They can range from simple icing to modern methods such as freeze-drying/irradiation. Significant development has taken place in the fish processing technology and degree of sophistication in the operation and handling in the last decades. Advances in the production technology and Quality control and monitoring systems have increased the precision and efficiency of fish preservation and handling.

In the course of fish processing technology, it is attempted to give an overview of the important types fish preservative methods, preparation of fishery products, quality assurance, Environmental impact of processing industry. It is hoped that this will be useful source of information for the students of fisheries science. And may inspire them to share their knowledge for the overall development of fisheries and fisher folk.

LEARNING STRATEGIES

In the modern era of globalization the introduction of new technologies ensure only the survival of the fittest. So it becomes a necessity to equip the leanness to face the growing challenges in the competitive world. Hence the traditional approach to learning is no more relevant in the present context. The teacher should use instructional techniques that motivate the students to construct his own knowledge. Now the learners are not passive listeners, but they are the active participants in the construction of knowledge. Here the teacher – student interaction should be given much importance.

In the new instructional strategy while selecting the methods of teaching, the social and psychological aspects of the learner is to be taken into consideration. The given activities for learning are only suggested ones. It can be altered according to the discretion of the teacher.

To obtain the objectives, the new system of education is introduced in the Vocational Higher Secondary Education for attaining the objectives of the courses in this system, we can adopt the following strategies.

I. Assignment

Assignment is some specific work assigned to the students as a part of their academic enrichment. There are learning activities undertaken as a continuation of class room activities to realize the curriculum objectives to a broader extent . They should be completed in time bound manner. They help to lead learner to higher level of learning from the present status. Challenging assignment can motivate the students to involve in group dynamics and achieve fruitful results. The teachers may at as a guide.

Assignment may be given on individuals or group basis. Assignment includes preparation of notes, preparation of charts, models, collection of materials from institutions etc. Assignments develop skills of reference, observation,

enquire reporting etc. It ensures the effective utilization of leisure time of the students.

II. Seminar

Seminar is a learning strategy involving an in-depth analysis of specific topic, preparation of a paper and presentation . The paper is presented by either one student or a group of students. After the presentation, there will be a discussion/ interaction in which all the students can participate . The students get an opportunity to clear their doubts and make clarification. Seminar helps to develop communication skill and overcome stage fright.

Stages

1. *Selection of Topic:* The topic of seminar should be relevant to the subject of study
2. *Assignment of topic to individuals students or team:* The topic may be assigned to one student or to a group of students.
3. *Collection of relevant information:* Information required for seminar can be collected from various sources namely books, magazines, internet, institutions, place and persons.
4. *Preparation of draft paper:* Based on the information collected the student may prepare a draft paper and submit it to the teachers for comments. Revise the draft paper based on the comments of the teachers. The refined draft is submitted for approval.
5. *Program scheduling:* The date, time and venue of the seminar is fixed. A seminar leader may be selected from the students
6. *Seminar paper presentation:* The student/ students shall present the paper in the seminar. The teacher may function as the moderator during the initial stages.
7. *Discussion / Interaction:* A number of respondents from the students make comments on the topic. This will be followed by a general discussion. All the group members should actively participate in discussion.
8. *Summing up deliberation:* The moderator sums up the deliberation
9. *Evaluation / Feed back:* Both teachers and students evaluate the programme.
10. *Preparation of final report:* A final seminar report is prepared covering all the additional points discussed and consolidated.

III. Panel Discussion

It is a learning strategy in which a panel of experts are allowed to discuss a specific subject under the control and direction of a moderator. Subjects can be divided according to the number of panel members. Number of panel members

are fixed according to subdivision of points in the subject. Relevant materials and handout may be given in advance to the learners. The monitor or moderator introduces the subject of discussion and invites a panel member to start the discussion. Each panel member is invited for discussion afterwards. After briefing by the panel members the questions are raised from the audience and the panel members give suitable answer to them. A report should be submitted by each learner to the moderator.

IV. Project

Project is a self-learning strategy which can exert great influence on the overall development of the learner. Project as learning strategy is to be selected where a problem arises in any part of the curriculum. The students may be divided into groups and assigned different aspects of the problem. Each group works independently. Specific aspects of the problem such as data collection, classification, analysis, report preparation and presentation is to be undertaken by each of the members. Even though the work is divided among the members, it must be ensured that the execution of each and every activity is done with the active participation of all. After analyzing data collected from different sources, the learner arrives at a conclusion that can help to solve the problem. Thereby learner learns the topic through his own activity. The other advantage of this learning activities is that it helps the learner to scientifically handle any problematic situation. It helps in the development of scientific thinking and thereby builds up the students aptitude for the subject.

Stages of the project

1. Selection of a topic

The project selected should be related to the curriculum and it should not be a project for projects sake. The topic or problem should arise from the curriculum.

2. Planning of the Project

- (a) Hypothesizing: Hypothesizing means making assumptions based on the available primary information.
- (b) Methods and Technique : The methods and Technique should be based on the aim and Hypothesizing of the Project. The nature of the project, suitability of the

tools, and the methods of learning should be related to each other.

3. Collection and Tabulation of Data

The data may be primary, secondary or tertiary. Either census or sampling method can be used based on the objective of the project. Suitable questionnaires are to be prepared for the collection of primary data.

The collected data is to be classified and tabulated so as to make it easily understandable.

4. Analysis of data and formulation of conclusion

By analyzing the data, the reliability of the hypothesis can be examined. Preparation of graphs and diagrams and maps will positively help the analysis. The similarities, relations and differences gathered from the analyzed information would tell whether the hypothesis should be accepted or rejected.

5. Preparation of Report

The cover page should have the title of the project, the period of study, name (s) of investigator/group, and the address of the school. The report should be structured in the following order.

1. Title
2. Preface
3. Hypothesis and aim
4. Methodology
5. Sources of data
6. Analysis and conclusion
7. Suggestions (if any)
8. References
9. Appendices (Questionnaire, Observation schedule, check list Etc.)

6. Presentation of the Project

When the project is presented, the learner is being evaluated and accepted. It is through this presentation that ideas are shared with others in the class and society.

The project methods promotes scientific self learning and makes him capable of solving the problem arising in real life situations.

V. Debate

Debate is a hot and interesting learning activities. A debate can be organized only on a topic on which there is difference of opinion. Therefore a topic suitable for debate has to be chosen.

Debate can be on relevant topic that is different and interesting to the students and relevant to society. Students with different opinions have to be identified for discussion. Those who have similar opinion should join together to form a side . Those who hold the opposite view with form the other side. It would be ideal to write down the topic of the debate and displayed in advance. There should also a person to control debate.

Students should be given opportunity to absorb the ideas obtained from discussion and debate, develop the idea through reading and study, and to express them through writing or other means

Stage of Debate

1. Topic Selection
2. Selection of panels keeping in balance with intelligence, gender etc.
3. Selection of moderator
4. Collection of information guided by the teacher
5. Conducting the debate under the control of moderator by avoiding any sort of personal conflicts
6. Conclusion by the moderator expressing his final version or verdict.

VI. Case Study

A case may be a person, institution or a community case study is an in-depth analysis of an actual event or situation. It presents real pictures of situation with facts, objective information or data. Learners analyses the case to interpret, predict and resolve issues associated with it. The case study provides the learner an opportunity to analyse and apply concepts, data and theory taught from the class. Learners can work individually or in groups.

By studying realistic cases in the classroom, students develop new insights into the solution of specific on – the – job problem and also acquire knowledge of the latest concepts and principles used in problem solving.

Case may be presented by the teachers or may be provided in print form.

A simple case study may have the following steps

1. Collection of data
2. Conversion of data into information
3. Analysis of the case in groups
4. Presentation of the finding by each group leader.
5. Evaluation

In addition to the above mentioned learning strategy there are many other learning strategies which can be used in appropriate situations to enrich learning process such as problem solving, Role play, brain storming, debate etc.

VII. Brain Storming

This is the best method for solving creative problems. It facilitates generation of ideas quickly. Rules for conducting Brain storming.

1. No response is wrong. So welcome every response.
2. Welcome as many responses as possible
3. No criticism is allowed
4. Allow to work on others idea

Steps in Brain storming

1. Presentation of the problem
2. Provide relevant information
3. Record the ideas put forth by the participants
4. Combine similar ideas
5. Evaluate each idea and solution
6. Selection of the best solution

If brainstorming is used as an instruction strategy, the last step is not essential

VIII. Discussion

Discussion is essential for the student to share new finding, idea and conclusion at each stage of learning with fellow students and teachers. In general discussion the teachers should guide the discussion through questioning and summarizing. The major steps involved are

1. Introduction initiated by the teacher

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2. Development of discussion by giving lead points and follow up interactions
 3. Transaction stage in which the key points are reviewed by the teacher and
 4. Summarizing stage in which teacher provides additional support materials to ensure the achievement of the objectives

IX. Group Discussion

Group discussion is an ideal method to develop cooperation, democratic attitude, friendliness and compromising attitude which are the ultimate aims of education. During group discussion the teacher may observe each group and it needed help them to channel the discussion towards the common objectives. All students may be given opportunity to take part and express their ideas within a time limit. The conclusion reached may be entered by each student. A group representative must present this during consolidation in which the teacher may correct or add informations to ensure that all the relevant ideas have been covered

X. Collection

Collection is a continuous learning activity, which ensures complete participation of students. The collected item may be materials, pictures, charts, ideas, data etc. Collection provides direct experience to learn. An exhibition of collected materials will help to strengthen the concept.

XI. Practical works

Experimentation contains the process skill in an integrated way. In the new approach of curriculum the student forms idea and comes to conclusion through process. The term 'Practical' when associated with a science subject usually means an experiment. The objective of doing an experiment is to explore new ideas through investigation only. Its main purpose is to verify some principles associated with theory. The subjects end here. But this is not the case with 'Vocational Practical'

The ultimate goal of a Vocational Education is to generate skill through continuous practice along with investigation and invention. Continuous practice transforms the unskilled to the skilled. This is the significance and importance of practical in the Vocational stream. Hence it is very crucial that Vocational teachers as well as instructor should understand the importance of vocational practical

and act accordingly.

XII. Quiz

Quiz programmes can be used as an interesting class room tool for transaction of curriculum objectives as well as to evaluate the effectiveness of transaction and achievement of students.

For conducting a quiz programme a topic should be selected based on the above objective

The students are asked to prepare questions based on the topic individually. The next day / next hour the students are grouped into 3-4 groups randomly. A question is raised by a particular team and the other teams to answer them if they can answer the question they get points for that if all other teams fail to answer the question raised by the 1st team the 1st team answer the question and explain the background if necessary. All the teams get equal number of chances to ask the question. Time limit is also prescribed for the conduction of the programme. The team who scores maximum points wins

All the participants can make notes on the questions asked, answers and their explanations which help them in learning

XIII. Models

Models are used in learning process. It enhance the leaning experience. This is based on the 'seeing is believing". It helps the learner a chance to see feel the model presented. Still models and working models help the students to understand the structure, working principles, actual operation etc.

Several steps are involved

1. Locating the problem
2. The teacher should plan the type of model according to co's
3. Grouping the students
4. Briefing the tasks
 - Aim
 - Need
 - Material required

-
- Source & Materials
 - Cost of materials
 - Division of Labour
 - Guidance
 - Fixing of a time limit
5. Presentation by each group about
 - How the models were prepared
 - Details of - Expenses
 - Working and principles
 - Finally documentation of the process
 6. Evaluation
 - By the other groups
 - Later a consolidation by teachers are to be done.

XIV. Games

Class rooms can be made attractive by introducing different types of games. Games should be interesting as well as informative. Some of suitable games are

1. Odd man out
2. Cross word puzzles
3. Match the following
4. Aswamedham
5. Link game – Answer using clues.

XV. Survey

This strategy involves collection of data from the group under study (book, person, materials etc.) It develops the social interaction and communication ability of the learner. It also provides a scope for discovery learning.

Step involved in survey

- 1 Objective of survey
- 2 Selection of area for survey/sampling frame
- 3 Selection of survey method

Direct method

With help of questionnaire/schedule

- 1 Tabulation and analysis
- 2 Consolidation and Presentation

XVI. Exhibition

It is a learning strategy by which the learner can get a chance to show the skill developed. It provides the intrinsic motivation and exposure.

Exhibition item can be conducted either individually or as a group task. It can be conducted at school / Regional/State/National level. Necessary publicity and other arrangements can be provided. Presentation, documentation, participation and innovative skills of the learner can be evaluated.

XVII. Interview

Interview is one of the important learning strategies taking the help of a resource person. Interview is an inner view. It provides opinion and information about a topic.

An interview is conducted by the following steps

1. How to introduce a problem?
2. Invite a resource person
3. Decide the questions by learners
4. Decide the time, place etc.
5. How to discuss?
6. How many students to participate?
7. Implementation of the interview
8. Conclusion (Facilitator)

Items required

- 1 Interview Schedule
- 2 List of questions prepared by learners Selection of students, selected names sequence of question

XVIII. Field Visit

Field visit is an inevitable vocational tool to be implemented in vocational Higher Secondary Education. This helps the students to familiarise with the modern technologies and new situation in a different atmosphere. It provides

learning through viewing. It is based on the principle that seeing is better than having. It enables the learner to retain the learned information longer and to make the subject more interesting. It motivates and gives more confidence in his/her particular vocation.

The facilitator should identify suitable center/ institution/site. Get prior permission from the authorities before conducting the field visit. Give instructions to the learners for collection data/information/materials/specimens. Teacher may assign different duties to learners by working them in different groups.

Each learner should take utmost care and interest during the visit. He/She should observe and interact at the center/ institution where the field visit is conducted.

After the visit, learner should acquire the ability to apply the ideas/concepts in his future carrier. Each learner should submit a detailed report about the field visit.

XIX. Demonstration

Through demonstration we can present an item/product and emphasize its features very effectively.

Eg:- To understand the functioning of a computer

1. Material/Item/Process
2. Demonstration
3. Venue
4. Additional requirements depending upon the nature of the item

Demonstration Process

1. Introduction about the item/Material
2. Principles – Working
3. Operation
4. Components
5. Merits of the item

XX. Chart display

It is also one of the important teaching aids. It can be used in every activities of

a learning process.

Chart display is a written or pictorial representation of idea or concept. It is abbreviate, brief and clear. It is prepared by study

Benefits

1. A learner gets clear idea about the concept
2. The leaner can retain the ideas in his mind for longer periods
3. A complicated idea can be simplified though a chart

Cheap method of teaching aid.

CURRICULUM OBJECTIVES

- To collect information about sun drying and mechanical drying, to analyse its spoilages, to suggest remedial measures and to develop skills in the preparation of dried fish products through discussion, field visit, practical work etc.
- To understand different types of driers through discussion/Field visit.
- To observe, collect information about different methods of salt curing, to analyse its spoilage, to suggest remedial measures and to develop skills in the preparation of salt cured products through discussion, practical work, field visit, Assignment, demonstration etc.
- To aware the constituents of smoke and smoking of fish through discussion.
- To learn Torry kiln as an electrostatic smoker through discussion.
- To develop skills in hot smoking and in the preparation of smoked fish product through practical work, field visit etc.
- To learn different methods of fish marinading, to analyse its spoilages, to suggest remedial measures and to develop skill in the preparation of fish marinades through discussion, Demonstration, Practical work etc.
- To collect information about freeze-drying, accelerated freeze- drying and to compare with conventional drying through discussion.
- To collect information about canning (Principle, different steps, can materials), to analyse its spoilages/defects, to suggest remedial measures and to develop skill in the preparation of canned fish products through discussion and OJT or field visit.
- To collect information about irradiation (Principle, Sources, different types, its application) and to realize its harmful effects through reading/discussion.

-
- To observe and collect information about different fishery products and to develop skills in its preparation, through field visit, project, practical, production cum training center, exhibition etc.
 - To identify and list out the uses of different instruments used in fish processing industry and develop skills in its operation through exhibition, demonstration and practical.
 - To collect information about quality standards and different systems of quality inspection.
 - To familiarize with components of a freezing plant and to develop skills in the production and inspection procedures, quality control, personal hygiene and factory sanitation.
 - To Collect information, analyse environmental impact and health hazards in fish processing industry, to develop awareness through seminar, survey etc.
 - To get an awareness about marketing strategies through discussion with demonstration.

SYLLABUS

Unit - 1 Drying of fish

Basic principle, Natural sun drying, mechanical drying. Factors altering drying note mechanical driers, solar driers, and Dried fish products. Defects in dried fish products and preventive measures.

Unit - 2 Salt curing of fish

Principal, methods of salting, spoilages of salted fish and preventive measures.

Unit - 3 Smoking of fish

Principle, Hot smoking, Torry kiln, smoked fish products.

Unit - 4 Marinading (Pickling)

Principle, Fried marinades, cooked marinades, spoilages of fish marinades and preventive measures.

Unit - 5 Freeze-drying

Principle, process

Unit - 6 Fish canning

Principle, steps in canning and its significance, can material, preparation of canned fish products, spoilage/defects of canned fish

Unit - 7 Irradiation

Irradiation of seafood

Unit -8 Fishery products

Fishery products- chitin, chitosan, shark fin and fin rays, fishmeal, fish body oil, shark liver oil, Fish maws and icing glass, fish skin leather. Pearl essence, Fish extract, shrimp extract, fish glue, fish fertilizer. Fish silage value added products- fish sausage, F.P.C laminated Bombay duck, fish soup powder fish wafer, fish cutlet, fish ball, fish fingers, and fish cake.

Miscellaneous aquatic products – Beche-de-mer, marine algal products
Unit – 9 Instruments used in fish processing industry

Pressure gauge, Hydrometer, Brine dispenser, Auto clave, pH meter, thermometer, hot air oven, incubator

Unit – 10 Quality control and standards

Quality standards, systems of quality inspection.

Unit – 11 Freezing plant

Components, Production and inspection procedure, quality control, personal hygiene and factory sanitation, lay out of freezing plant.

Unit – 12 Impact of fish processing

Impact of pollution due to fish processing and their control, Human health hazards.

Unit – 13 Fish marketing

Marketing strategies

LIST OF PRACTICALS

- 1) Practical on simple sun drying of fish.
- 2) Mechanical drying of fish
- 3) Preparation of dried fish fillet.
- 4) Preparation of dried prawn pulp.
- 5) Dry curing of fish
- 6) Wet curing of fish
- 7) Preparation of Monna cured fish
- 8) Preparation of Colombo cured fish.
- 9) Hot smoking of fish
- 10) Preparation of smoked sardine flakes
- 11) Preparation of Fried fish pickles
- 12) Preparation of cooked fish pickles
- 13) Preparation of clam pickles
- 14) Preparation of fish cutlet
- 15) Preparation of fish wafers
- 16) Preparation of fish ball
- 17) Preparation of fish soup powder
- 18) Preparation of F.P.C
- 19) Preparation of fish fingers
- 20) Preparation of fish cake

PLANNING

The annual plan is prepared after examining the curricular objectives textbook Source book & other learning materials. This is approximately the sum total of all the activities extending a year. This helps to know in advance the activities both inside and outside of the classroom and for organizing learning experiences in the form of projects, discussions, debates, seminars etc. at appropriate time. The year plan included in this source book is flexible in nature and revise and rearrange the activities and create favourable opportunities for providing positive learning experiences on the basis of locality aspects with the support of school support group (SSG) and School Resource Group (SRG) with the help of annual plan the teacher can transact the curriculum systematically within the stipulated time while framing the year plan the following points should be kept in mind.

- Field visit of various units can be clubbed together, if there is practical difficulty in conducting these field visits separately or unit wise.
- The OJT should be conducted before January.
- Types of products and period of operation can be modified on the basis of raw materials, availability, season, demand etc.

YEAR PLAN

Unit	Month	Topic	Activities	Time/ Hours	
				Theory (140 hrs)	Practical (420 hrs)
I Drying of fish	June	• Fish drying	Discussion	1	--
		• Sun drying and Mechanical drying	Discussion	3	--
			Practical	--	5
		• Defects in dried fish products and its preventive measures	Demonstration and Discussion	2	--
			Discussion	4	--
		• Operation of different types of driers	Field visit	--	7
			Practical	--	12
• Dried fish products	Production cum training	--	16		

Unit	Month	Topic	Activities	Time/ Hours	
				Theory (140 hrs)	Practical (420 hrs)
II Drying of fish	June	<ul style="list-style-type: none"> • Salt curing • Defects/spoilage in salt cured product and its preventive measures 	Discussion Practical P.C.T Field visit Assignment Demonstration & Discussion	2 -- -- -- 4 3	-- 19 16 7 -- --
III Smoking of fish	July	<ul style="list-style-type: none"> • Concept of smoking of fish • Constituents of smoke • Hot smoking • Torry kiln • Smoked fish products 	Discussion Discussion Field visit/ Practical Discussion Practical	2 2 -- 2 --	- -- 7 - 14
IV Marinading (Pickling)	July	<ul style="list-style-type: none"> • Fish Marinading • Spoilages found in marinades 	Discussion Practical P.C.T Demonstration and Discussion	2 -- - 3	- 19 40 --
V Freeze-drying	July	<ul style="list-style-type: none"> • Freeze drying 	Discussion Group Discussion	6 2	- --
VI Fish canning	August	<ul style="list-style-type: none"> • Concept of canning • Canning process • Can materials • Spoiled canned products 	Discussion Field visit Demonstration and Discussion Demonstration and Discussion	2 7 3 4	- 7 -- --
First Term Evaluation					
VII Irradiation	September	<ul style="list-style-type: none"> • Irradiation of fish 	Discussion Discussion	6	-

Unit	Month	Topic	Activities	Time/ Hours	
				Theory (140 hrs)	Practical (420 hrs)
VIII Fishery products	September	<ul style="list-style-type: none"> • Fishery products • Fish meal 	Field visit	--	7
			Field visit	--	7
	October	<ul style="list-style-type: none"> • Fishery by products • Value added products 	Project	33	--
	November		Exhibition	--	7
			Practical	--	60
		P. C.T	--	70	
IX Instruments used in fish processing industry	November	<ul style="list-style-type: none"> • Instruments used in fish processing industry 	Discussion with	4	--
			Demonstration		
			Operation	--	13
			Field visit	--	7
X Quality control and standards	December	<ul style="list-style-type: none"> • Importance of quality standard • System of Quality inspection 	Discussion	2	-
			Assignment	6	--
			Interview	6	--
XI Freezing plant	December	<ul style="list-style-type: none"> • Freezing plants 	O.J. T	--	80
		Second Term Evaluation			
XII Impact of fish processing on environment and health	January	<ul style="list-style-type: none"> • Environmental pollution • Health Hazard 	Seminar	12	-
	February		Survey	12	--
XIII Fish Marketing	February	<ul style="list-style-type: none"> • Marketing strategy 	Discussion	5	-
	March		Final Term Evaluation		

N.B : O. J.T can be conducted either in a freezing plant, in a canning plant or any other fish processing industry.

Unit Plan

In order to convey the curricular objectives to the students, the teacher should make adequate and prior preparation in making effective classroom transaction. This is the plan of a unit to enable us to complete the activities by inter relating the year plan in a time bound manner with suitable modifications on the basis of local demands and environment.

A sample unit plan is given. Find out more and more learning processes and introduces it in the classroom by applying different strategies of teaching learning.

UNIT PLAN

CURRICULUM	CONTENT/ OBJECTIVE	ACTIVITIES/ AREAS	MATERIALS EXPERIENCES	PRODUCT	EVLUATION	REFERENCE
<ul style="list-style-type: none"> To learn different method of fish marinading, to analyse its spoilages. To suggest remedial measures and to develop skills in the preparation of the marinades through discussion, demonstration, practicals etc. 	<ul style="list-style-type: none"> Action of acetic acid Action of salt Action of spices Fried marinades Cooked marinades Bacterial spoilage Fungal attack Rancidity 	<ul style="list-style-type: none"> Discussion Practical Demonstration and Discussion 	<ul style="list-style-type: none"> Fish, Aceticcid, salt, Spices, Container Spoiled fish pickles 	<ul style="list-style-type: none"> Preparation of notes Pickle Preparation of notes 	<ul style="list-style-type: none"> Participation Participation Participation 	<p>Fish processing technology</p> <p>K.K. Balachandran</p>

Daily Plan

Daily plan gives a detailed plan for each hour Co's can be included and may be divided on the basis of similarities, ideas and activities. This section can be divided into two parts as process/Learning activities and response. If an activity require more than one day to complete a single daily plan is enough for all these days.

While framing the daily plan the following points should be kept in mind;

- Learning activities should be formulated in such a way for developing the various skills of the learners.
- Active engagement of all the (learners should be ensured.
- Learning Activities should be challenging, interesting.
- Response part of the daily plan can be completed only after the activities.
- Future planning should be based on this feedback.

In response column the teacher should note about the process/activities, learners and the teacher himself.

DAILY PLAN

Name of Teacher	:	Joseph Alex
Name of Unit	:	Freeze – drying
Name of Class	:	II FPT
Time	:	9.30 – 10.30
Curriculum Objective	:	To collect information about freeze- Drying and Accelerated Freeze – Drying through discussion.

Activity	Responses
<p>General Discussion</p> <ul style="list-style-type: none"> • Heat a piece of camphor and a piece of ice in two different plates by using spirit lamp or a candle • Ask the learners to observe it? • What happens to ice • What happens to campher • What do you call the direct conversation of solid into vapour? • Teacher says Ice can also be sublimated by creating vacuum. This is the technique used in the preservation method freeze-drying <p>Divide the class into five groups. Distribute reference materials to each group. Ask the group leaders to present their findings</p>	<ul style="list-style-type: none"> • Vivek and Manoj did not show much interest • Participation Ram and Gopi actively participation in the discussion whereas sheela and seema involved little. • Involvement of teacher was not satisfactory • Presentation of Raju from group an excellent

Consolidation points

- Direct conversion of solid in to vapour – sublimation
- Principle behind freeze drying is sublimation
- Freeze dying does not affect the cell structure
- Freeze dried products can be rehydrated
- Hygroscopic
- Nutritional quality is best.
- Accelerated freeze drying is done to over comes the difficulties freeze drying

EVALUATION

Evaluation is a systematic process of collecting, analyzing, synthesizing and interpreting evidences of students' progress and achievements both in cognitive and non-cognitive areas of learning. Evaluation has to play significant role in making the learning process more effective. It provides diverse experiences to the learners, keeping in view the skill to be attained continuously by them.

As the curriculum is based on a particular vocation the selected stream is the most important part and it should be evaluated accordingly. Technical skills, interest and devotion in the field, communication skills, organizational and presentation skills are to be evaluated. Evaluation of the personal and social qualities also should be done. So the evaluation should be continuous and comprehensive.

Terminal or Term End Evaluation (TE)

It is the written form of evaluation aimed at evaluating the facts, concepts and ideas gained by the learner. The test should not be aimed to evaluate the memory alone. Questions are framed in such a way that the learners are able to apply different mental process while answering. The Terminal Evaluation questions give more emphasis on application, analysis and synthesis level.

The maximum scores for TE is 80 and the minimum is 24 (30%). The questions should be formulated taking into consideration the time required to read, think, understand and write answers. These aspects should be considered while fixing the scores also. To avoid blind guessing, multiple choice and application level questions may be mixed. The total number of questions may vary from time to time. All the questions should be based on the curricular objectives. Open ended questions may be included. Choice questions, if included also should be based on the same curricular objectives.

Continuous and comprehensive evaluation (CCE)

Our traditional evaluation methods measure only the memory and recollection capacity of the learner. To eliminate/ overcome the limitation the evaluation should be done on multi dimensional ways by measuring multiple intellectual capacities of the learner. So it is better to evaluate the learner in a continuous and comprehensive manner. CCE helps the learner to understand and develop his own progress and to develop adequate strategies for further improvement.

Merits

1. Assess the all round development of the learner on a continuous basis through a variety of activities.
2. Effective feed back is possible
3. Remedial diagnostic teaching is possible
4. Process as well as products are assessed.

A series of learning activities are grouped into five major thrust areas as follows

Investigative activities

Activities which create a spirit of enquiry, investigation and a mind for research in the learner belong to this group.

For example.

1. Study project
2. Case study
3. Field study

Interactive activities

Activities which improve the communication skill, activities of sharing ideas, etc.

For example

1. Seminar
2. Panel discussion
3. Debate
4. Group discussion

Assigned task

Activities assigned to the learners to enrich/ strengthen the concept and ideas.

For example

1. Assignment
2. Collections

Performance task (Tests)

Activities related to the achievements of the learner.

For example

1. Class test (oral/ written/ performance test)
2. Quiz
3. Open book examination
4. Interview

5. Group testing

Practical based activities

For example

1. Preparation of working model
2. Album
3. Improvisation

From the above five group of activities, the teacher has the freedom to choose any three areas for evaluation purpose.

1. Investigative activity

Sl.No.	Stages	Criteria	Score	Total Scores
1.	Planning	Planning Relevance of the study Identification of problem Ability to select appropriate tools, ability to select suitable bearing method.	4/3/2/1	
2.	Data collection	Ability to collect sufficient and relevant data. Ability to classify and arrange data for analysis. Reliability and authenticity of the data collected.	4/3/2/1	
3.	Analysis and inference	Ability to analyses the data Systematic arrangements. Ability to draw inferences based on analysis. Ability to give suggestions based on inference.	4/3/2/1	
4.	Report Presentation	Ability to present in logical and sequential order, authenticity of report, time bound comparison.	4/3/2/1	
5.	Viva-Voice	Knowledge of content and process. Ability to analyses data. Ability to justify inference. Ability to explain. Strategies and methods adopted.	4/3/2/1	

Case Study

Sl.No	Criteria	Score	Total Scores
1.	Identifying the problem	43/2/1	
2.	Approach to the problem	43/2/1	
3.	Time bound Action	43/2/1	
4.	Analysis of the problem	43/2/1	
5.	Problem solving / Reporting	43/2/1	

Field study

Sl.No	Criteria	Score	Total Scores
1.	Attitude and readiness towards the task	43/2/1	
2.	Capacity for Observation	43/2/1	
3.	Data collection	43/2/1	
4.	Application of ideas	43/2/1	
5.	Documentation / Recording	43/2/1	

Assignment

Sl.No	Criteria	Score	Total Scores
1.	Awareness of the content	43/2/1	
2.	Comprehensiveness of the content	43/2/1	
3.	Systematic and sequential arrangement	43/2/1	
4.	Observation/suggestion/views/judgment/evaluation	43/2/1	
5.	Timely Submission		

Seminar

Sl.No	Criteria	Score	Total Score
1.	Planning and Organization	43/2/1	
2.	Collection and data / content	43/2/1	
3.	Observation / appraisal and clarity	43/2/1	
4.	Content knowledge	43/2/1	
5.	Presentation	43/2/1	

Debate

Sl.No	Criteria	Score	Total Score
1.	Readiness to participate	43/2/1	
2.	Depth of subject knowledge	43/2/1	
3.	Communication skill	43/2/1	
4.	Ability to justify the stand	43/2/1	
5.	Presentation	43/2/1	

Group Discussion

Sl.No	Criteria	Score	Total Score
1.	Readiness to participate	43/2/1	
2.	Depth of subject knowledge	43/2/1	
3.	Communication skill	43/2/1	
4.	Ability to justify in a democratic way	43/2/1	
5.	Leadership quality	43/2/1	

Interview

Sl.No	Criteria	Score	Total Score
1.	Planning	43/2/1	
2.	Preparation of Questions	43/2/1	
3.	Communication skill	43/2/1	
4.	Participation	43/2/1	
5.	Report preparation	43/2/1	

Practical Evaluation (PE)

The goal of vocational Education is to generate skills through continuous practices along with investigation and innovations. Continuous and comprehensive practice transforms the unskilled learner to a skilled one. This is the importance and significance of vocational practicals.

PE is done to evaluate the practical skills achieved by the learner in the concerned vocational subject Total Scores for PE is 150 and minimum is 60 score ie 40%. Practical Examination is conducted for a batch of 8 learners having 6 hours duration.

Practical evaluation should be done taking into account the whole practicals included in the curriculum since learning of practical skills is a continuous process through out the period of study.

Vocational Competency Evaluation (VCE)

Vocational Competency Evaluation is to evaluate the vocational skill and aptitude developed by the students during the learning process. This is a system to judiciously evaluate the required value addition and consequent capacity building in the concerned vocational curriculum. The vocational education is aimed at developing interest, skills and devotion in specific vocational fields. As other evaluation components like CE, PE and TE cannot assess the vocational competencies and professional skills, acquired by the students an internship evaluation (IE) components has been introduced to meet this requirement.

Internship evaluation should be done based on the following components like regularity and punctuality, value addition and capacity building.

1. Regularity and punctuality

Regularity and punctuality has vital role in vocational education learning continuous process, the regular presence of the learner is must for attaining maximum efficiency.

2. Value Addition

Value addition is the qualitative measure of the learner's interest, devotion perseverance and efficiency. Value addition can be evaluated through conducting field visits/ vocational survey. The experiences gained through field visit / vocational survey increases the level of intrinsic motivation and positive attitude towards the vocational field and thereby increase his value as a semiprofessional.

3. Capacity Building

It gives a quantitative measure of the student's skill in graded area exposure. Capacity building can be evaluated through conducting the following activities.

1. OJT / Simulated experiment
2. Performance – camp/exhibition/clinic
3. Performance – PCT/Service cum Training center.

These components help the learner to practise the acquired skills in the real situation and thereby increasing self-confidence and promoting self reliance.

Vocational Competency Evaluation Indicators

No	Items	Scores
1.	Regularity and punctuality	10
2.	Field visit / survey (anyone) vocational project	20
3.	OJT/Simulated experiment performance – Camp/exhibition /clinic Performance – PSCTC (anyone)/Practical skills	20
Total		50

1. Regularity and punctuality can be assessed by using attendance of the learner and time bound completion of tasks. It is evaluated by using 5 point grading system.

Rating scale

Sl.No.	Item	1	2	3	4	5
1.	Regularity	Never regular	After regular	Equally regular	Most of the time regular	Always
2.	Punctuality	Never regular	Often punctual	Usually punctual	Most of the time punctual	Always punctual

Item	Evaluation indicators	Scores	Score
Value addition	<i>Field visit</i>		
	1. Attitude and readiness towards the task	4/3/2/1	
	2. Capacity for observation	4/3/2/1	
	3. Data collection	4/3/2/1	
	4. Application of ideas	4/3/2/1	
	5. Documentation/recording	4/3/2/1	
	<i>Or</i>		
	<i>Survey</i>		
	1. Planning	4/3/2/1	
	2. Data collection	4/3/2/1	
3. Consolidation of data and analysis	4/3/2/1		
4. Drawing inference	4/3/2/1		
5. Reporting	4/3/2/1		

Capacity Building	<i>OJT/Simulated experiment</i>	
	1. Involvement/participation	4/3/2/1
	2. Skills in doing work/ communication skills	4/3/2/1
	3. Time bound action	4/3/2/1
	4. Capacity for observation, analysis and innovation	4/3/2/1
	5. Documentation, recording and display	4/3/2/1
	<i>Or</i>	
	<i>Performance in camp/exhibition/clinic</i>	
	1. Ability for planning and organizing	4/3/2/1
	2. Mastery of subject	4/3/2/1
	3. Ability for communication	4/3/2/1
	4. Innovation	4/3/2/1
	5. Involvement/social commitment	4/3/2/1
	<i>Or</i>	
	<i>Performance in production/service cum training center (PSCTC)</i>	
	1. Mastery of vocational skills	4/3/2/1
	2. Managerial capacity	4/3/2/1
	3. Promoting self confidence	4/3/2/1
4. Innovation approach	4/3/2/1	
5. Promoting self reliance	4/3/2/1	

CRITERIA FOR PROMOTION

A minimum of 80% attendance is required to register for the public examination. Those who are having at least 65% can apply for condonation from higher authorities. Those who have shortage of attendance below 65% should repeat the second year.

The students should obtain minimum 30% score in all subjects separately in TE. In first year if the student failed to obtain 30% minimum score in any subject he will be promoted and will be given chance for improvement.

The students should obtain a minimum of 40% score in the vocational practical Evaluation (PE) that is 60 out 150 score. If a student fails to attain the minimum required score for TE and secure minimum score for pass in TE, he need not reappear for practical examination and vice versa.

UNT

1

DRYING OF FISH

Introduction

Drying is a simple and cheap method of fish preservation. It is an effective method of preservation especially during glut season (peak season). Lack of hygiene, chances of contamination and uncertainty in weather conditions, affects the quality of dried fish products and thereby marketing. To enhance market acceptability awareness about hygienic practices and mechanical drying are essential. In this unit simple sun drying and mechanical drying are included.

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To collect information about sun drying and mechanical drying, to analyse its spoilages/defects, to suggest remedial measures and to develop skills in the preparation of dried fish products through discussion, field visit, practical work etc. 	Inactivation of bacteria & enzymes Removal of water	Discussion		Preparation of notes	Participation in discussion
	Sun drying Mechanical drying	Discussion Practical work	Fish, salt, chemicals, polythene bags	Preparation of notes Dried fish products	Participation in discussion Performance
	Defects in dried fish products	Demonstration & Discussion	Dried fish products	Preparation of notes	Participation
	Types of driers	Discussion Field visit	Charts/OHP/ Multimedia/ Models	Preparation of notes	Participation

Discussion on Fish drying

The learners knew that altering of environmental factors can prevent bacterial growth.. Conduct a discussion about prevention of spoilage by reducing the moisture content. Teacher can consolidate that; removal of moisture content inactivates bacteria and enzymes

Discussion on sun drying and mechanical drying

Conduct a discussion about simple sun drying in your locality.

Points for discussion

- Utilization of solar energy
- Weather conditions
- Contamination
- Quality
- Peak season
- Packing
- Merits and demerits
-
-

Teacher can consolidate the discussion points and leads the learner to the need of artificial / mechanical drying by emphasizing the demerits of sun drying

Factors affecting drying
<ul style="list-style-type: none">○ Relative humidity of air○ Air velocity○ Product thickness○ Temperature

Practical on sun drying and mechanical drying

To develop skills in sun drying and mechanical drying, practical can be done

Drying parameters	
Temperature	:-45-50°C
Relative humidity	:- 55-65%
Air velocity	:- 100-120m/ mins
Process Time	:-14 – 16 Hrs

Discussion on comparison between sun drying and mechanical drying

Divide the class into two groups. Ask one group to support the sun drying and oppose the mechanical drying and vice versa list out the points

Comparison of sun drying and mechanical drying

SUN DRYING	MECHANICAL DRYING
<ul style="list-style-type: none">❖ Cheap method❖ Climatic condition can't be controlled❖ Time consuming and no continuous❖ Contamination is more❖ Moisture content lowered up to 15-20%	<ul style="list-style-type: none">❖ Expensive❖ Controlled❖ Quicker and predictable❖ Less❖ can be up to 1-5%

Demonstration and Discussion on defects in dried fish products and its preventive measures

Demonstrate dried products with different quality problems. Conduct a general discussion and list out the points

Teacher can consolidate

- Shrinkage
- Case hardening
- Browning

-
- Dehydration rate
 - Changes in colour and flavour
 - Denaturation of protein
 - Toughening of texture
 - Mould infestation
 - Insect attack

Discussion on Operation of Different types of Driers

Conduct a discussion on different types of driers such as Tunnel drier, Rotary drum drier, Cabinet drier and Solar drier developed by CIFT, by using charts / OHP multimedia / models. List out the points. Teacher may consolidate

- Structure
- Operating temperature
- Working
- Type of product

Different types of driers

Cabinet Drier: -

The fish to be dried are spread on trays and placed in the cabinet in fixed position or trays are arranged on a trolley and are pushed into the cabinet. Air is forced over a heater across the fish until the product get dried up

Tunnel drier

It consists of a wooden cabinet divided horizontally into two chambers. The upper chamber has an electric heater; air is forced across the heater by a blower and it is turned down by one air reflector into the lower chamber in which fish to be dried spread on trays are loaded one above the other. A part of the hot air, which yet laden with moisture from the fish is sucked out by an exhaust fan

Rotary drum drier

It is a double walled cylindrical metallic drum fitted horizontally on a shaft and can be rotated by an electric motor. Steam is passing through the inter space between the walls of the drum and the materials on the drum get dried. These driers are suitable for fishmeal production.

Solar drier

In this, heat absorbed from solar radiation is used to heat air. It is achieved by drawing air through black painted metallic pipe in zigzag manner, when it is heated by exposure to the sun. The heated air is blow through a chamber in which fish to be dried are spread.

Field visit to mechanical fish drying units

Conduct field visits to IFP and CIFT or any other drying units. Collect information's about the operation of different types of driers and prepare a field visit report.

Practical on Dried fish products

Prepare dried fish fillets and prawn pulp to develop the skills in the preparation of dried fish products.

Dried Fish Fillet

It is prepared by beheading the fish, and take flesh from both sides called fillets. Dipping in saturated brine solution containing 3% sodium propionate and 0.1% BHA for 15 minutes and then dried

Dried Prawn Pulp

The cooked prawns are dried in the sun. Separate the shell by taking it inside gunny bags and beaten against a hard surface. After this edible pulp are separated from the shell particles by winnowing.

C.E component

Field visit to a fish drying units.

T.E component

1. A shoal of fish is trapped in the net of a fisherman in a rainy day. He was not able to market it. So he decided to preserve it. Can you guess the method he has chosen? Give reasons.
2. Ashok purchased a packet of dried fish fillets. He felt that the surface of the product get hardened, but the interior remain wet. Can you identify the quality problem? How can it be prevented?

UNT

2

SALTCURING OFFISH

Introduction

Salt curing is a traditional method of fish preservation. It is one of the cheapest and simplest methods. Traditional fishermen can do this method because it does not require much technical know how. Salt cured products are cheap, so have good internal and external market. Salt curing is more suitable during glut season (peak fishing season) This unit deals with different types of salt curing, their spoilage and preventive measures which aims to give practical experience to the learners to make quality salt cured products

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To observe, collect information about different methods of salt curing, to analyse its spoilages, to suggest remedial measures and to develop skills in the preparation of salt cured products through discussion, practical work, field visit, assignment, demonstration etc. 	<p>Osmosis</p> <p>Prevention of bacterial growth</p> <p>Inactivation of enzymes</p>	Discussion		Preparation of notes	Participation in discussion
	<p>Wet curing</p> <p>Dry curing</p> <p>Mona curing</p> <p>Colombo curing</p>	Practical work	Fish, salt, chemicals, Malabar tamarind, polythene bags, etc	Salt cured products	Performance
	<p>Dun</p> <p>Pink</p> <p>Rust</p> <p>Infection by insects</p>	Demonstration & Discussion		Field visit report	Using indicators
		Assignment	Reading materials	Assignments	Using indicators
		Demonstration and discussion	Spoiled salt cured fish products	Preparation of notes	Participation

Discussion on salt curing

Start discussion by asking questions

- How can you preserve tender mangoes or goose berries?
- What are the changes that you can observe in salted mangoes?
-
-
-

List out the points and lead the learners to,

- Osmosis
- Inactivation of enzymes
- Prevention of bacterial growth

Practical on salt curing

Practical can be done to develop skills in different types of salt curing.

Different Types of Salting

Steps	Dry curing	Wet curing	Mona curing	Colombo curing
Process	<ul style="list-style-type: none">• Preparation of raw material.• Scrubbing of salt in 1:3 to 1:10• Soaking and restacking• Rinse in potable water• Drying• Weighing and packing	<ul style="list-style-type: none">• Preparation of raw material• Salting is done as in drying• Allowed to remain in brine until marketing	<ul style="list-style-type: none">• Preparation of raw materials by pulling the viscera through mouth• Salting is done like dry curing	<ul style="list-style-type: none">• Preparation of raw material• Salting as in dry curing• Place dry pods of malabar tamarind (gorukka puly)• Stocked in wooden barrels• Fill the barrels with saturated brine• Closed water tight
Type of fish used	<ul style="list-style-type: none">• Lean	<ul style="list-style-type: none">• Faty	<ul style="list-style-type: none">• Fishes (Mackerel)	<ul style="list-style-type: none">• Medium size
Shelf life	<ul style="list-style-type: none">• 3 months	<ul style="list-style-type: none">• 7 to 10 days	<ul style="list-style-type: none">• 50 days	<ul style="list-style-type: none">• 6 months

Field visit on salt curing

Conduct a field visit to a salt curing yard. Allow the learners to observe the procedures, sanitation, hygienic practices, types of fishes, quality of salt, packing methods etc. and collect information about availability of raw materials, transportation, quality of salt used, shelf life, feasibility, etc through an interview with the processor / supervisor. Prepare a field visit report

Assignment on different types of salt curing

Ask the learners to prepare an assignment on different types of salt curing such as dry curing, wet curing, Colombo curing and Mona curing. Issue reading materials to the learners.

Demonstration and discussion on defects/spoilages in salt cured products and its preventive measures

Demonstrate different spoiled salt cured products. Ask the learners to observe the specimens and note the defects. Conduct a discussion about it. Teacher can consolidate that the different types of defects in salt cured products are dun, red, pink, rust and attack of insects. Also consolidate the preventive measures.

Type of Spoilage	Causative agent	Identification	Source	Preventive measures
Dun	<ul style="list-style-type: none">Halophilic mould <u>Sporendonema epizoum</u>	<ul style="list-style-type: none">Chocolate Yellowish Brown spots	<ul style="list-style-type: none">Solar salt	<ul style="list-style-type: none">0.1% Sorbic acid
Red/ Pink	<ul style="list-style-type: none">Halophilic bacteria <u>Serratia</u>, <u>Micrococcus</u>, <u>Sarcina</u>	<ul style="list-style-type: none">Pink/ Red Slimy patches	<ul style="list-style-type: none">Solar salt	<ul style="list-style-type: none">Sodium meta bisulphate or prop ionic acid
Rust	<ul style="list-style-type: none">Fat oxidation	<ul style="list-style-type: none">Colour of rust	<ul style="list-style-type: none">Exposure to air	<ul style="list-style-type: none">BHA/ BHT
Infestation by insects	<ul style="list-style-type: none">Maggots, flies small beetles and other insects	<ul style="list-style-type: none">Presence of larvaeExcretaDamages such as dents disintegration	<ul style="list-style-type: none">Unhygienic Practices during ProcessingDrying and storage	<ul style="list-style-type: none">Hygienic handling

Composition of curing mixture

Sodium benzoate	-	0.2%
Potassium sorbate	-	0.5%
BHA	-	0.2%
Common salt	-	99.1%

C.E components

Field visit on salt curing

Assignment on salt curing

T.E components

1. A fisherman complains that chocolate spots appeared on salt – cured products during storage. Can you help him to find out the reason for this problem and suggest remedial measure?
2. Following are certain properties of salt, how it help to preserve the fish
 - dehydration through osmosis
 - denaturation of enzymes
3. A customer purchases or selects a packet of salt cured product with white patches. What advice can you give to him?
4. Calculate the quantity of salt needed for dry salting of 100 Kg Scianids in the ratio 1:3

UNIT

3

SMOKING OF FISH

Introduction

In Lakshadweep islands, Tuna is preserved by using smoke. Smoking is another traditional method. Smoked products fetch more prices than salted or dried products. The attractive flavour and colour of the smoked products increases its demand. This unit explains the concept of smoking, constituents of smoke and the process of smoking.

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To aware the constituents of smoke and smoking of fish through discussion. 	Removal of moisture Bactericidal activity Antioxidant properties Gaseous parts Aqueous distillates Tar distillates	Discussion	Charts showing the constituents	Preparation of note	Participation
<ul style="list-style-type: none"> To learn Torry kiln as an electrostatic smoker through discussion 	Working	Discussion	Charts Multimedia	Preparation of note	Participation
<ul style="list-style-type: none"> To develop skills in hot smoking and in the preparation of smoked fish product through practical, field visit etc 	Process of hot smoking Masmin Smoked sardine flake	Practical Field visit	Fish, saw dust salt, chemicals polythene bags etc	Smoked products Field visit report	Performance Field visit indicators

Discussion on Smoking of fish

Learners have previous knowledge about traditional fish preservation methods. Lead learners to a discussion about preservative effect of smoke on fish. List out the points. Teacher can consolidate

- Smoking is a traditional method
- Heat in the smoke removes moisture
- Bactericidal and antioxidant properties of smoke

Discussion on constituents of smoke

Discussion can be began with,

- What are the states of matter?
- Are these states present in smoke?
- What are the gaseous matters present in the smoke?
-
-

List out the points Teacher can consolidate

- Smoke is an aerosol
- Different constituents of smoke
- Preservative effect of each constituent
- Carcinogenic substances

Constituents of smoke

Gaseous part	Aqueous distillates	Tar distillates
Oxygen	Alcohol	Guaiacol
Hydrogen	Ketons	Cresol
Nitrogen	Aldehydes	Catechol
Carbon dioxide	Acids	Phenols
Carbon mono oxide	Formic acid	
	Acetic acid	
	Propionic acid	

Carcinogenic substance

Smoke contains traces of a poly nucleo aromatic hydro carbon-3, 4 Benzopyrene, which is a carcinogenic substance

Field visit on Hot smoking

Arrange a field visit to IFP or any other hot smoking unit. Ask the learners to collect information about

- Source of smoke
- Raw materials
- Process
- Operation of smoke kiln
- Packing
- Shelf life
- Feasibility
-
-

Instructions have been given to prepare a field visit report

Practical on Hot smoking

To develop skills in hot smoking, practical can be done as:

- Preparation of raw materials
- Dip in saturated brine solution containing 3% sodium propionate and 0.1% BHA for 15 minutes
- Smoked at a temperature above 55°C for 4 hours

Discussion on Torry kiln

Discuss about Torry kiln by using charts and multimedia. Ask the learners to prepare notes on working.

Torry kiln

It is discovered by Torry Research station, Scotland and widely used in UK for fish smoking. Torry kiln consists of a smoke chamber in which saw dust or wood chips are burned to produce the smoke. The equipment is provided with an electrostatic precipitator, fan etc. The smoke produced from the chamber passes through the filter, where large particles are filtered. Electrostatic precipitator absorbs remaining impurities. Purified smoke is allowed to pass through an electric heater by a fan. The smoke particle gets charged and it is forced to the products, which is kept in trolleys.

Practical on smoked fish products

Prepare masmin and smoked sardine flakes to develop skill and discuss its preparation.

Masmin

It is a specially cured product made out of tuna. The method is widely employed in the Minicoy islands of Lakshadweep. The fish is cut longitudinally to get pieces of 12-17 cm in length, 4-5 cm width and is then wrapped in green coconut leaves. It is produced by the combined process of salting and repeated drying and smoking

Smoked sardine flakes

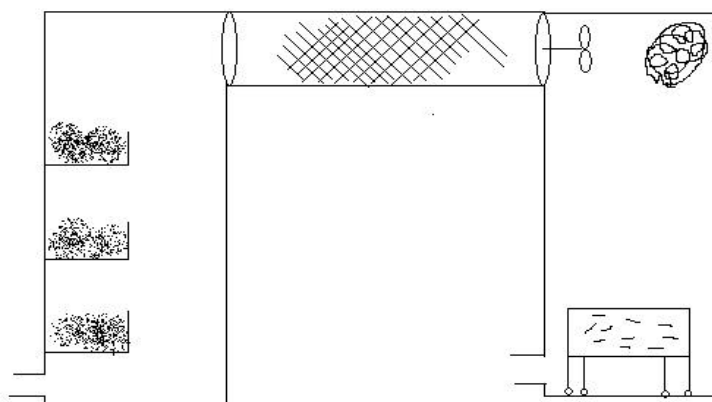
After the preparation, the fish are dipped in saturated brine containing 3% sodium propionate and 0.1% BHA for 15 minutes. Then it is spreaded on trays and smoked for 6 hours at 70-80°C in smoke produced from coconut husk or saw dust. The smoked fish is peeled-off manually and flesh flaked-off. Packed in polythene sheets.

CE components

Field visit on hot smoking of fish

TE components

1. Can you identify the given diagram? In which preservation method it is used? What is its advantage over Traditional method?



2. Find out the smoked product?

1. Laminated Bombay duck

2. Masmin

3. Sardine Flakes

4. Dried Fillet

3. Find the odd man out?

Phenol, acetic acid, Benzo pyrene, formaldehyde

Introduction

Ready to serve products have good demand in markets. Fish marinades are ready to serve products. The main market of fish marinades is metropolitan cities. It is a delicious side dish used widely. Preparation of marinades is very simple and it is also cheap. Pickle produced in IFP has great demand, especially in north India. The above factors made clear that this unit has great significance. This unit deals with the preservative action of acetic acid and salt in marinades, different steps involved in marinading, different methods practiced etc.

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To collect information on different methods of fish marinating, to recognize its spoilages, to suggest remedial measures and to develop skills in the preparation of fish marinades through discussion, demonstration, practical work etc. 	Action of Acetic acid Action of salt Action of spices Fried marinades Cooked marinades	Discussion Practical PCT	Fish, acetic acid, salt, spices, containers	Preparation of notes Pickle Pickle	Participation Performance Performance
	Bacterial spoilage Fungal attack Rancidity	Demonstration and discussion	Spoiled fish pickles	Preparation of notes	Participation

Discussion on Marinading

Discussion can be commenced by showing a bottle of pickle and ask the learner,

- How it remain without spoilage
- Do you know, which acid is used in pickles?
- Can we use acetic acid for preserving fish?
- Which are the preservatives used in pickling?
-

List out the points. Teacher can consolidate,

- Preservatives used
- Preservative effect of acetic acid
- Preservative effect of salt
- As a ready to serve product
-

Practical & PCT on Marinading

As a ready to serve product, fish marinades have great prospects in the prevailing life situation. It needs less capital investment. Hence it can offer much self-employment opportunities. It reveals the necessity of skill development in the preparation of fried and cooked marinades. So practical work and PCT have to be conducted.

Cooked marinades	Fried marinades
❖ Preparation of raw material	❖ Preparation of raw material
❖ Blanche in a solution containing 1-2% acetic acid and 6-8% salt at 85 ⁰ C for 10-15 minutes	❖ Mix with salt and dry partially
❖ Spices are added to improve the flavour and odour	❖ Fried in oil at 160-180 ⁰ c for 5-12 minutes
❖ Pack in a medium of 2% acetic acid and 3% salt	❖ Spices are added to improve the flavour and odour
	❖ Pack in a medium of 2% acetic acid and 3% salt

Demonstration and discussion on spoilages found in Marinades

Demonstrate different spoiled fish marinades. Ask the learners to observe the specimens and identify. Conduct a discussion on it.

Teacher can consolidate different types of spoilages and its remedial measures

Spoilage agents	Preventive measures
❖ Bacterial spoilage	❖ Potassium sorbate, Sodium borate, Sodium benzoate
❖ Fungal attack	❖ Propionic acid
❖ Rancidity	❖ BHA, BHT

TE components

1. Suppose your mother is preparing fish pickle in your home. What are your suggestions to her to increase the shelf life of the pickle?
2. You are provided with HCl, H_2SO_4 , CH_3COOH . Choose the suitable acid for fish pickling. Explain
3. A Kudumbasree unit decided to pack the fish pickle in the following types of containers
 - Glass
 - Polythene bags
 - Plastic bottles
 - Aluminium can

Do you agree with their decision, Explain?

UNIT

5

FREEZE-DRYING

Introduction

People pay more importance to quality. Common preservation methods don't assure excellent quality. It leads to think of an alternative method – freeze-drying. In this unit, principles, process, merits and demerits of freeze- drying are included.

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To collect information about freeze-drying, accelerated freeze-drying and to compare it with conventional drying through discussion 	Sublimation Process Quality	General Discussion Group Discussion		Preparation of note Preparation of note	Participation Participation

Discussion on Freeze-drying

Heat a piece of camphor and a piece of ice in separate plates. Ask the learners to observe the changes. Conduct a discussion and leads them to

- Sublimation - direct conversion of solid into vapour without passing through liquid phase.
- Freeze drying
- Removal of water without altering the cell structure
- Dehydration
- Nutritional Value
- Colloidal structure of protein
-
-
- Process of freeze-drying
- Lack of provision for the ready escape of vapour from the freeze- drying unit.

List out the points. Teacher can consolidate

- Provision for ready escape of vapour in A.F.D
- Process
- Quality
- Packing
- Storage
- Feasibility
-
-
-

Group discussion on comparison

Group discussion can be conducted to compare accelerated freeze- drying with conventional drying. List out the points.

Teacher can consolidate.

Conventional drying	Accelerated drying
Shrinkage	No Shrinkage
Rehydration limited	Rehydration more
Short shelf life	Long shelf life
Cost of production less	Cost of production more
Not hygroscopic or fragile	Product hygroscopic or fragile

TE components

1. A processor has to preserve certain seafood without altering the colloidal structure of protein. Suggest a method. Why?

2. Anand visited a supermarket to purchase a fishery product. He has noticed both conventional dried and freeze dried fish product in the shop. He preferred freeze-dried product. Can you say what prompted him to select freeze-dried product?

Salt curing: Osmosis, Freeze-drying : _____

Introduction

Military services have faced with the problem of feeding the fighting forces with ready to serve products having long shelf life. It leads to the invention of a new food preservation technique named appertisation by a French confectioner, Nicholas Appert to satisfy the need of French Army. The process underwent several radical changes in course of time and renamed as canning. The acceptance of canned product is due to its long shelf life. This unit deals with canning process, spoilages and its remedial measures.

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To collect information about canning (principle, different steps, can materials), to analyse its spoilages/defects, to suggest remedial measures and to develop skills in the preparation on canned fish products through discussion, demonstration and OJT or Field visit 	Heat Treatment Hermetical sealing Vacuum Steps in canning Significance of different steps Can materials Physical spoilage Chemical spoilage Microbial spoilage	Discussion OJT Field visit Demonstration with Group discussion Demonstration with discussion	Tin cans Aluminum cans Glass jar Retort pouch Spoiled canned foods	Preparation of notes OJT Report Field visit report Preparation of notes Preparation of notes	Participation OJT indicators Field visit indicators Participation Participation

Discussion on canning

Discussion starts with asking a few questions

- Why do you boil drinking water?
- How the microbes destroy?
- Do all the microbes destroy during boiling?
- What can we do for complete destruction of microbes?
- Can you support a method to raise the boiling point of water?
-
-

List out the points. Teacher can consolidate,

- Father of canning
- Pressure and Temperature relationship
- Thermal destruction of microbes
- Inactivation of enzymes
- Hermetical sealing

Temperature pressure relationship	
Temperature (^o C)	Pressure (lbs /Inch ²)
107	4
110	6
116	10
120	14
121	15

Discussion on steps in Canning process

Conduct a discussion about different steps and its significance in canning with the help of charts/ OHP/ multimedia. List out the points. Teacher can consolidate different steps as,

- Preparation of raw materials
- Brining and precooking / blanching and its significance
- Weighing and filling

- Exhausting and its significance
- Seaming
- Retorting
- Cooling and its significance
- Packing and storage

**Significance of Blanching /
Brining / Precooking**

- ❖ Removal of Blood / Slime etc
- ❖ Shrinkage of material
- ❖ Removal of gases from the cans
- ❖ Reduction in bacterial load
- ❖ Denaturation of enzymes
- ❖ Preservation of vitamin C

Significance of Exhausting

- ❖ Prevent Rancidity
- ❖ Create vacuum
- ❖ Prevent rust formation
- ❖ Prevent growth of aerobic bacteria
- ❖ Retain colour of the product

Significance of cooling

- ❖ Create vacuum
- ❖ Prevent struvite formation
- ❖ Prevent germination of spores
- ❖ Prevent over cooking
- ❖ Prevent bulging of can ends

OJT / Field visit on canning process

Arrange **On Job Training** in canning at IFP or any other canning plant to develop skills. Instruction can be given to the learners,

- To observe the process
- To understand the operation of equipments
- To familiarize with hygiene and sanitary condition
- To collect information about marketing strategy
- To prepare a report
-

Those who have difficulty in arranging OJT, a field visit can be arranged to IFP or any other canning plant. Instructions can be given to the learners to observe

and conduct a structured interview to collect necessary information about canning.
Prepare a field visit report

Demonstration with Group Discussion on Can materials

Demonstrate different containers of canned products

- Tin can
- Aluminum can
- Glass jar
- Retort pouch

Conduct a group discussion by dividing the class into 4 groups, ask each group to discuss about the merits and demerits of the given containers. Each group can present their findings in the class. Teacher can consolidate,

- Materials
- Feasibility
- Handling
-

Demonstration with Discussion on Spoiled Canned products

By using spoiled cans/charts/multimedia a demonstration can be conducted and discuss various types of spoilages found in canned products. List out the points. Teacher can consolidate.

Spoilages in Canned Seafood

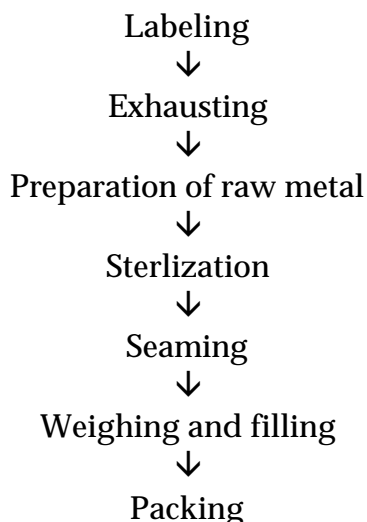
Physical	Chemical	Microbial
Panelling	Struvite formation	Flipper
Physical swell	Rust formation	Springer
Physical damages	Chemical swell	Soft swell
Retort burn	Blue discoloration	Hard swell
		Botulism

CE Components

Field visit on Canning process

TE Components

1. Rearrange the Flow chart



2. During a field visit to a canning plant you found a delay in cooling after sterilization. Comment on it?
3. An entrepreneur approaches your consulting firm. He plans to produce canned fish product in polythene bags. What is your suggestion about it?
4. Lists of chemicals are given in the table which chemical can you select for the purposes listed below.

1. To arrest bacterial growth
2. To reduce rancidity
3. To prevent fungal growth
4. To prepare a pickle
5. To prevent struvite formation

- | |
|---|
| <ul style="list-style-type: none"> • Sorbic acid • Propionic acid • Acetic acid • EDTA • BHA |
|---|

5. During quality analysis of a canned product, pieces of glass crystals like substances are found. Can you explain about it?
6. Complete the tables.

Spoilages /defects	Causative agent	Symptoms
❖ Dun	-----	-----
❖ -----	-----	Hard swell
❖ -----	High temperature	Hard texture
❖ Struvite	-----	-----

UNT

7

IRRADIATION

Introduction

Once nuclear power was misused for destructive purpose and now we have realized its constructive potential in sterilization. It leads to the concept of irradiation. Even though radiations have many side effects some countries are exploiting the possibilities of radiations for fish preservation. This unit deals with different types of radiation and its sources.

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To collect information about irradiations (Principles, source, different types application) and to realize its harmful effects through reading /Discussion 	Sterilization Damage to genetic materials of microbes Ionization of water Source of radiations Radurisation Radicidation, Radappertisation Sterilizations of process water Loss of nutrient value Organoleptic changes	Discussion		Preparation of notes	Participation

Discussion on Irradiation of fish:

Conduct a discussion about historical disaster at Hiroshima and Nagasaki and leads the learners to irradiation. List out the points. Teachers can consolidate

- Sterilizations
- Damage to the genetic material of microbes
- Ionization of water
- Sources of radiation
- Used in sterilization of processing water
- Only used in combination with other preservation methods.
- Harmful effect.

Source of radiations

X-ray is produced from isotopes like Cobalt-60, Cesium-137 and Strontium-90.

U-V radiation also used as a source.

Types of radiations

- | | | |
|---------------------|---|-------------------------------|
| 1. Radurisation | : | Dose below 0.5 mega rad |
| 2. Radicidation | : | Dose between 0.5 – I Mega rad |
| 3. Radappertisation | : | Dose above 1 mega rad |

TE Components

1. Odd man out and why?

Cobalt-60, Cesium-137, Carbon-12, Strontium-90

2. Environmentalist strongly opposes the use of irradiation in seafood industry. Can you suggest some points to support the views of the environmentalist?

Introduction

Fishery based products have not been popularised among consumers in India. It can be produced with out much investment and sophisticated technology. Production of fishery-based products can be included in the rural development programmers. These products can be prepared not only from value fishes but also from cheaply available trash fishes and process waste. If properly marketed, it helps the development of rural economy of India. Encouraging the production and marketing of fishery by-products through cottage industries can create self-employment opportunities.

Hence this unit aims at familiarizing and developing skill in various fishery based products and their production

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To observe and collect information about different fishery products and to develop skills in its preparation through field visit, project, practicals, production-cum-training, exhibition etc 	Raw materials Procedure Process Packing Shelf life Uses	Field visit Project Practical work PCT Exhibition	Raw materials Ingredients Equipments etc. Fishery products	Field visit report Project report Fishery products Fishery products	Field visit indicators Project indicators Performance Performance Performance

Field visit to familiarize with fishery products

Arrange a field visit to CIFT or any other fishing industry for familiarizing, observing and collecting information about the raw materials, shelf life, packing and uses of the

- Byproducts such as chitin, chitosan, glucosamine HCl, shark fin and fin rays, fish meal, fish body oil, shark liver oil, squalene, fish maws and isinglass, fish skin leather, pearl essence, shark cartilage, fish extract, shrimp extract, fish glue, fish fertilizer, surgical sutures, fish silage
- Value added products such as fish sausage, FPC, laminated bombay duck, fish ham, fish soup powder, fish wafers, fish curry in pouches, fish pickles
- Miscellaneous aquatic products such as Alginic acid, agar-agar, carrageenin, beche-de-mer, ambergris

After field trip, the report shall be discussed and consolidated in the class.

Field visit to Fishmeal Plant

Conduct a field visit to a fishmeal plant of matsyafed at Azheekkod or any where for familiarizing with commercial production of fishmeal.

Project on the preparation of fishery byproducts

Guide the learners to form groups and assign each group to prepare a fishery byproducts mentioned below. Ask each group to present their project and if clarity is needed allow other groups to clear their doubts. Points shall be noted by the learners. Teacher may consolidate the procedure after each presentation. Later a consolidated report shall be submitted by each group. The final project report should have

- Introduction
- Identification of the problem
- Defining the aim
- Methodology
- Collection of information
- Production
- Suggestions and conclusion

By-products

1. **Fish body oil** - It is used as an artificial rubber-filling compound, as a lubricating agent and in the manufacture of detergents
 - Mincing
 - Cooking
 - Pressing
 - Centrifuging
 - Heating (in water bath)
 - Packing
2. **Chitosan:** - Used as food additive, sizing material in leather industry, chelating agent and artificial skin
 - Demineralisation with 1:2 ratio 5% HCl for 30 minutes at room temperature
 - Deprotenisation with 1:1 ratio 5% NaOH and boiled for 30 minutes
 - Deacetylation with 60% KOH or NaOH in 1:1 ratio for 90 minutes at 100°C
 - Powdering and packing
3. **Sharkfin Rays** - It is used in soup preparation
 - Soaked in water
 - Dipped in 10% hot acetic acid at 60°C
 - Separate the skin and flesh and wash with water
 - Drying and packing
4. **Fish Silage** - It is used as cattle and poultry feed
 - Mincing
 - Dipped in formic acid at 3.5 pH for 3 to 5 days
 - Storage
5. **Fish Fertilizer**
 - Acid digestion method
 - Alkali digestion method
6. **Shrimp Extract** - Large quantities of prawn waste are thrown away as a waste. The high percentage of protein present in the waste can be isolated for human consumption or as animal feed.

Process

- After washing, mince fresh prawn waste
- Boiled with NaOH and filtered
- Filtrate is neutralized with Acetic acid
- Neutralised filtrate is concentrated to obtain a semisolid mass
- Packed in polythene bag and frozen

7. Fish meal preparation

Wet Rendering	Dry rendering
Cut the fish in to pieces Cook till oil floats Remove oil Press the cooked material using canvas bags/screw press / cotton cloth Dry in a drier Pulverising Packing	Drying Pulverising Packing

Practical on value added fishery products:

Practical can be conducted to develop skills in the preparation of value added fishery products given below

1.FishCutlet**Process**

- 1 Cook fish in small amount of boiling water for 20 to 30 minutes and drain
- 2 Remove skin and separate the meat from bone and minced
- 3 Add salt and turmeric powder to the mined meat and mix well
- 4 Fry chopped onions in oil till browns fry chilly and ginger and mix it with mixed meat
- 5 Add mashed potato and spices and mix well with the meat
- 6 Shape 40gm each of this in the firm of cutlet dip in beat eggs, roll in bread powder and store in deep freezer
- 7 Thaw and fry in oil before use

Ingredients

Cooked fish meat	-	1000g
Salt	-	25g(as needed)
Oil	-	125ml
Green chilly	-	15g
Ginger	-	25g
Onion	-	250g
Potato	-	500g
Pepper	-	3g
Clove	-	3g
Cinnamon	-	2g
Turmeric	-	2 g
Egg	-	4 Nos
Bread Powder	-	200g

2.FishWafers:

- 1 Homogenise the processed fish meat with water for 10minutes.
- 2 Add the corn flour, tapioca flour and salt and rest of the water and blend the whole mass for one hour.
- 3 Spread the homogenized mass uniformly in aluminum trays in a thin layer of 1-2 mm thickness and cook in steam for 3-5 minutes
- 4 Cool to room temperature
- 5 Cut the cooked material into desired shape and dry under sun or preferably on artificial drier at 45 to 500 C to a moisture content below 10%.
- 6 Pack suitable lots of dried product in sealed polythene bags, or glass bottles and stored in cool and dry place till marketing. The product can be stored in good condition for two years.

Ingredients

Processed fish meat	-	2kg
Corn flour	-	1kg
Tapioca starch	-	2kg
Common salt	-	50 g
Water	-	3.5 liters

3. Fish Ball

1. Mix mince prepared from fish using a mechanical meat bone separator after heading, gutting and washing thoroughly with 1% salt and 5% corn starch. (spices like garlic, ginger etc can be added).
2. Prepare balls 2-3 cm in diameter from the resultant mass and cook in boiling 1 % brine for 5-10 m
3. cool the cooked balls after which they are battered and breaded.
4. pack the balls either as such or after frying in vegetable oil.
5. preserve by freezing.

4. Fish soup powder

1. Blending of the processed fish meat 1/5 of water.
2. Fry the onion followed by coriander and pepper
3. Add to fried onion all other ingredients other than milk powder to the blended fish and again blend till it becomes a thick paste
4. Drying as thin layer on aluminium trays at about 70° C in a mechanical drier.
5. Powdering and incorporation of skimmed milk powder.
6. Packing.

Storage life of the product is one year. For the consumption 5 gm of this powder is boiled in 100 ml water for 5 minutes.

Ingredients

Picked cook meat	- 750 gm
Salt	- 170 gm
Fat	- 125 gm
Onions	- 750 gm
Coriander	- 12 g
Starch	- 250 g
Milk powder	- 100g
Sugar	- 30gm
Pepper	- 15 g
Ascorbic acid	- 1.5g
Carboxy methyl cellulose	- 3g
Monosodium glutamate	- 10g

5. Fish Protein Concentrate

It is a colour less and taste less stable product intended for human consumption. It contains 66.7% protein and can be incorporated with several food products to enrich the protein content. Storage life of the product is 3 to 4 years at ambient temperature.

Process

1. Preparation of cooked minced meat
2. Repeated processing, deodourisation and defatening using ethanol or Hexene –iso-propanol and filtration
3. Steam stripped to remove last trace of solvent.
4. Drying
5. Pulverising and packing

6. Fish fingers:

1. Preparation of minced fish meat.
2. Mix it with 3 % salt to get a paste
3. Freezing
4. Shape it into the form of a finger
5. Battering and Breading
6. Frying

7. Fishcake

1. Preparation of cooked minced meat and ingredients
2. Ingredients are mixed with minced meat to get a paste.
3. Mix the paste with blended carrot pieces
4. shape the mixed paste into form of a cake using mould.
5. Steam cook – in a water bath.
6. Dried in an oven
7. Frying for two minute.

Production cum Training Center for Value added fishery products

Since value added fishery products have a great demand in the local market a production cum training center can be started in the school. P.C.T. Centers will not only provide a thorough training opportunity but also income. Teachers can arrange these centers and give guidance to prepare and promote sale of Value added fishery products.

Exhibition on Fishery products

An exhibition shall be conducted in the school or available area for various fishery products prepared in the school. This activity will help the students to enhance the self-confidence and help in exposure to market conditions.

CE Components

Field visit to familiarize with fishery products

Field visit to fishmeal plant

Project on the preparation of fishery products

TE Components

1. Identify the product using the following hints?
 - Prepared from waste;
 - NaOH is used for the preparation
 - Used in textile industry
 - A medicinally important by product is prepared from it.
2. A large shoal of trash fish were landed on a beach.
 - What do you mean by trash fish?
 - Can you suggest a way to convert it into money
 - Name a trash fish
3. A doctor prescribed fish liver oil to a patient. Can you explain what are the possible deficiencies that the patient experiences.
4. Odd man out, Why?

Fish manure, Chitin, Fish wafers, Fish silage
5. Match the following,

Surgical sutures	-	Body oil
Ambergris	-	Prawn shell waste
Glucosamine HCl	-	Intestine
Factice	-	Air bladder
Isinglass	-	Sperm whale

6 Calculate the ingredients needed for the preparation of fish cutlets as per the following recipe from 2.300 Kg of Nemipterus japonicus.

<i>Cooked fish meat</i>	-	<i>1000g</i>	<i>Salt</i>	-	<i>25g</i>
<i>Oil</i>	-	<i>125ml</i>	<i>Green chilly</i>	-	<i>15g</i>
<i>Ginger</i>	-	<i>25g</i>	<i>Onion</i>	-	<i>250g</i>
<i>Potato</i>	-	<i>500g</i>	<i>Pepper</i>	-	<i>3g</i>
<i>Clove</i>	-	<i>3g</i>	<i>Cinnamon</i>	-	<i>2g</i>
<i>Turmeric</i>	-	<i>2g</i>	<i>Egg</i>	-	<i>4Nos.</i>
<i>Bread powder</i>	-	<i>200g</i>			

7. Shark fin rays _____
_____ Kidney membrane
Shark liver oil _____
_____ Kwashiorkor
_____ Clarification of wine

UNIT

9

INSTRUMENTS USED IN FISH PROCESSING INDUSTRY

Introduction

A processing technician should have awareness about different instruments used in fish processing industry. Knowledge in the operation and uses of the instruments help the technician to tackle emergency situations. This unit deals with general awareness, operations and uses of different instruments in fish processing industry.

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To identify and list out the uses of different instruments used in fish processing industry and develop skills in its operation through exhibition, demonstration and practical. 	Identification Working Uses	Exhibition Demonstration Practical	PH meter Brine dispenser Thermometer Autoclave Pressure gauge Hydrometer Hot air oven Incubator Furnace Colony counter	Preparation of notes Developments of skill	Participation Participation

Exhibition and Demonstration of instruments

An exhibition and demonstration of different instruments, used in fish processing industry can be arranged. Demonstrate the operation of each instrument and ask the learners to operate themselves. Discuss its uses. Teacher can consolidate

- pH meter
- Brine dispenser – find out concentration of brine
- Thermometer
- Auto clave – wet sterilization
- Pressure gauge
- Hydrometer – moisture
- Hot air oven – Dry sterilization
- Incubator – Bacteria culture

UNIT

10

QUALITY CONTROL AND STANDARDS

Introduction

Developed countries look India as a nation, which produces poor quality and unhygienic food products. So our seafood products have less demand in these countries. In the early stage, the quality of the product processed and exported by our seafood industry in India was highly heterogeneous. This was mainly due to the lack of sufficient technical knowledge and lack of infrastructure facilities. Prime importance should be given to maintain quality in process and the learners should have knowledge about quality control and standards. This unit is meant to get awareness about the national and international standards and quality management.

Discussion on Importance of Quality

Present an incident of food poisoning reported and discuss it with learners and lead them to

- Causes of food poisoning
- Importance of quality control
- Role of quality standards
-
-

Assignment on Quality Standards

Provide reference materials by expanding the tips that have given in the source book. Help the learners to form group, let them to discuss and collect information and to prepare individual assignments.

QUALITY STANDARDS

1. BIS

The main objective is to formulate qualifying standards for the various products including fishery products and its components are following.

- To check physical specification of product such as weight, size etc.
- To check the chemical parameters of the product and composition such as food additives ingredients etc.
- To check the microbial parameters and avoid the contamination of the product.
- To check the organic requirement.

BIS Specification for Frozen Fish	
Raw material	: Fresh and clean
Signs of spoilage	: Nil
Freezing temperature	: Less than -40°C
Freezing Time	: Less than 2 hours
Organoleptic quality	: Superior.
T.P.C	: Below 5

2. Codex Alimentaries Commissions

It is an international organization for the formulation of food standards to use globally. The aim is to protect consumer's health and ensuring their trade practice. Those standards are used by member countries to formulate their own standards. The Codex documents include proficiency in respect of good hygiene, contaminants, and food additives, labelling presentation and sample selection.

3. ISO-9000

International national organization for standardization was established in 1946 with headquarters at Geneva, Switzerland. The purpose of ISO is to promote, the development of standardization globally to facilitate the international exchange of goods and services.

4. US FDA

It is enforced by the US Government for the safety of general public. It is intended to ensure that food is pure, wholesome, safe and produced under hygienic conditions. The requirements under US FDA are name and address of manufacturer, net weight, common name of food, ingredients in the food, source of raw material, nutritional labeling, production code indicating date of production food additives etc.

5. EUS standards

It is prescribed by the countries of European Union. Microbial standards, heavy metal standards and drug residual content prescribed in EU standard make it unique from other quality standards.

US FDA, EU and Japanese standard for fish and fishery products

Particulars	Raw Products	Cooked products
TPC	5x10 ⁵ /gram	1x10 ⁵ /gram
Feacal coliforms	20/gram	Nil
Coagulate +ve <i>Staphylococcus</i>	100/gram	100/gram
<i>Salmonella</i>	Absent/25 gram	Absent /25 gram
<i>V. Cholerae</i>	Absent/25 gram	Absent /25 gram

STRUCTURAL INTERVIEW ON SYSTEM OF QUALITY INSPECTION

Conduct a structural interview with a quality control expert (Expert from EIA/ processing plants/CIFT/IFP etc). The interview should cover the following points.

- Importance of quality
- System of quality inspection.
- Agencies conducting quality inspection
- HACCP
- EU standards
-
-

Learners have to note the points and teacher can consolidate.

DIFFERENT SYSTEMS OF QUALITY MANAGEMENT AND INSPECTION

1 Pre-Shipment Inspection

Prior to shipment finished product is inspected by EIA based on specification laid by BIS

2 IPQC

The entire processing operations are supervised by the trained inspection officers posted by EIA in each processing plant.

3 MIPQC

The processors are to establish their own quality control lab and personnel. They are authorized to self certify their products as fit for the export and the processors have to get themselves registered with EIA

4 HACCP

It is a preventive control system in which hazard is controlled or eliminated before it is occurred. It is a total quality management based on consumer safety

through systematic approach to the identification assessment and control of hazard.

Steps in HACCP

1. Identification and assessment of hazard
2. Determination of critical control point
3. Specification of criteria for critical limit.
4. Monitoring of CCP.
5. Corrective actions.
6. Verification
7. Record keeping

TE Components

1. A freezing plant gives more emphasis to critical control point for maintaining quality. Identify the system of quality control does the plant follow? Mention the steps to be followed.
2. The given table shows the quality analysis of a cooked fish product.

TPC	4x10 ⁵ /gram
Feacal coliforms	10/gram
Coagulase positive <i>Staphylococcus</i>	200/gram
<i>Salmonella</i>	Absent
<i>V. cholerae</i>	Absent

- Does the product has any quality problem?
- If yes, what precautions have to be done to overcome the quality problem

Introduction

In modern world traditional fish preservation gave way to sophisticated methods like freezing. Freezing plants have popularized in almost all fish producing countries. In India frozen fish product influence our economy. Freezing plants provide great employment opportunities to rural sector. This sector has immense potential for providing more employment opportunities to the learners. So emphasis has to be given to '**On Job Training**' in a freezing plant.

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> • To familiarize with components of a freezing plant and to develop skills in the production procedures, quality control and personal hygiene and factory sanitation. 	<ul style="list-style-type: none"> - Lay out - Freezers - Cold store - Machineries - Steps in canning - Organoleptic quality analysis - Microbial quality analysis - Estimation of available chlorine - Personal hygiene - Factory sanitation 	<p>On Job Training</p>		<p>On Job Training report</p>	<p>On Job Training indicators</p>

On Job Training In Freezing Plant

Arrange O.J.T in a freezing plant. Instructions can be given to the learners

- To familiarize with different components of a freezing plant.
- To observe, collect information and develop skills in the production and inspection procedures, Quality control, personal hygiene and factory sanitation.
- To prepare a layout of freezing plant and an OJT report.

TE Components

1. In the compressor room of a freezing plant, workers feel suffocation with pungent smell and irritation to their eyes. Can you guess why does it happen?

UNT

12

**IMPACT OF FISH
PROCESSING ON
ENVIRONMENT AND HEALTH**

Introduction

Concern for environment has increased recently because of the unsustainable developmental activities practiced by both developed and developing countries leading to environmental pollution. The argument that the industries provide employment and their by the growth of the economy can't be accepted. Since the impact of pollution from industries and revenue loss associated with it is greater than contribution of industries to the society as a whole. So planers and governments follow sustainable developmental practices without affecting the balance and harmony within the environment. The seafood industries should take adequate measures to prevent the emission of pollutants to safe guard the environmental balance.

Public health hazards arising due to adulteration and indiscriminate use of food additives and preservatives are not uncommon in India. The unit gives an insight into these problems and remedial measures to be taken to safe guard the health of the consumer

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To collect information, analyse environmental impact and health hazards in fish processing industry, to develop awareness through a seminar, survey etc. 	Polluting agents Preventive measures Occupational Health Hazard Public health hazard	Seminar Survey	References	Seminar report Survey report	Using indicators Using indicators

Seminar on Environmental Impact of Fish Processing Industry

Learners have knowledge about environmental impact of industries. Based on this, encourage the learners to collect information regarding the environmental impact of fish processing industry, to prepare documents and it to present in the seminar. Teacher could ensure that the learners can goes through the following points.

Air pollution

Causative agent	Effect	Preventive measures
Ammonia	Toxic, highly irritant to eyes, suffocating	Prevention of leakages, regular monitoring and maintenance
Freon	Causes ozone layer depletion	Prevention of leakages regular monitoring and maintenance.
Smoke	Bronchial problems carcinogenic	Use of chimney with scrubbers (solid filter)

Water pollution

Causative agent	Preventive measures
Oil and Greeze	Greese Traps, Oil separator
Suspended Solid particles	Sedimentation pond
Dissolved solid particles	Oxidation pond
Microbial load	Use Disinfectant
B.O.D	Reduce Organic waste
C.O.D	Reduce chemical waste

Water pollution

Causative agents	Effects	Preventive Measures
Solid waste	Bad odour, harbours rodents, insects etc. which spread contagious diseases	It can be used for the preparation of manure.

Survey on Human Health Hazard

Teacher can divert the attention of learners to the health hazards caused by substances like MSG, Sodium Benzoate etc. Guide the learners to conduct a survey on Human Health hazards prevailing in the fish processing industry. Teacher can prepare questionnaire with the participation of learners based on the consolidation points given below.

- Exposure to chlorine, ammonia etc. causes bronchial problems.
- Direct contact with ice and water for prolonged period causes pain and rheumatic problems.
- Allergic reactions due to contact with the detergents, chemicals, chlorinated water etc.
- Health problems due to food preservatives, food additives, food pigments etc
- Food Poisoning
- Distribute the questionnaire among the learners. Let them to collect information individually from fish processing units. Guide them to analyse information and prepare a report.

CE Components

1. Seminar on environmental impact of fish processing industry
2. Survey on Human health hazard.

No.	Indicator	Yes	No
1.	Do you feel any irritation while using detergents		
2.			
3.			
4.			
5.			

2. Examine the given items and classify it. List out the items in the given table. Write suitable heading to each column

-
- Ammonia
 - Discarded prawn shell
 - Freon
 - Oil and grease
 - Smoke
 - Detergents

Water pollutant

4. Suppose your local body organized a meeting to tackle the problem created by the processing wastes from a processing plant. What will be your suggestion to dispose the wastes economically?

Introduction

Marketing today has become household term even though it is a management jargon. Modern marketing has replaced conventional marketing both in service and production sector. It is highly competitive and inevitable for all kinds of products. Industries spend large part of their investment for innovative marketing strategies. But these developments in marketing has affected the prospects of cottage industries and even small scale industries, which is the backbone of the rural as well as urban economy of a developing country like India. Many small-scale industries were wiped out as they could not compete with multi-national companies with better marketing strategies. So fish processing industries in India require marketing strategies that will enable them to survive in a highly competitive global market. This unit make students aware of these developments and introduces them to modern trends in marketing and helps students to bring innovative ideas in marketing to exploit the opportunities as well as challenges of globalization .

Unit at a Glance

Curriculum objective	Content Area	Activities/ Experiences	Materials	Product	Evaluation
<ul style="list-style-type: none"> To get an awareness about marketing strategies through discussion with demonstration 	Marketing strategies	Discussion with demonstration		Preparation of notes	Participation

Discussion with demonstration in marketing strategies

Attract the attention of learners to an advertisement with the aid of a bit notice or paper cutting. Discuss the strategies of marketing. List out the points. Teacher can consolidate.

- Mode of packing and packing material shall vary with type of consumer and market.
- Label should have brand name, product name, name of producer, ingredients directions for use, price, date of manufacture, expiry date, net weight, gross weight, License number/ barcode of manufacturer etc.
- Price should be fixed by considering the type of consumer market and demand.
- Products with varying quantities can be marketed to satisfy all types of consumers.
- Exploit the market through '**Kudumbasree**' unit, door-to-door delivery, supermarkets etc.

TE Components

1. Prepare a cover slip (label) for marketing fish pickle produced by one of your friends.

PRACTICAL EVALUATION

Max. Marks : 150

Time : 6 hrs.

Identification of fishery products and instruments. 30 marks

10 Numbers, three marks for each

Practical work 60 marks

- a) Procedure - 10 marks
- b) Work done - 40 marks
- c) Perfection - 10 marks

Diagnosis, situation analysis and develop solution 30 marks

- a) Problem identification - 10 marks
- b) Analysis - 10 marks
- c) Remedy - 10 marks

Viva voce 20 marks

Record 10 marks

SAMPLE QUESTION PAPER FOR PRACTICAL EVALUATION

Max. Marks : 150

Time : 6 hrs.

- I. Identify and comment on the given fishery products and instruments
(10X3) **30 marks.**

- II. Prepare fish cutlet and write the procedure. **60 marks**

- III. Diagnose and analyse the spoilage/ defects found in the given fishery
products and recommend the remedial measures. **30 marks**

- IV. Viva-voce on Field visits, OJT, PTC, Project, etc. **20 marks**

- V. Record **10 marks**

REFERENECE

1. Fish Processing Technology - T.K. Govindan
2. Fish Processing Technology - Dr. Gopakumar
3. Fish Processing Technology - K.K. Balachandran
4. Fish and Fisheries of India - K.P. Biswas
5. Fish as Food - Borgstrom
6. Quality control Assessment - CIFT
7. Summer Institute on
8. Fish Processing Technology - CIFT
9. Sea food Quality Assurance - CIFT

INTERNETSITES

1. listserv@searn.sunet.se
2. <http://dir.yahoo.com/aquaculture/fisheries>
3. [http://www.webscope.com/fishhelp/info.htm/.](http://www.webscope.com/fishhelp/info.htm/)