

タイ国理科教育
総合報告書

昭和55年9月

国際協力事業団

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は し が き

理科教育協力事業は開発途上諸国の理科教育の教育水準を向上させ、社会的・経済的発展の基盤づくりに貢献しようとするものであり、わが国は昭和41年度から開発途上国の中等教育段階（中学校及び高等学校）の理科教育担当教員及び理科教育養成大学学生に対し、指導を行なうため、専門家の派遣と併せて機材供与、研修員受け入れを実施しております。

本報告書は昭和54年1月30日から7月29日まで、タイ国派遣専門家としてペブリ教員大学にて化学の指導、協力に従事された田矢一夫氏の貴重な成果をまとめられたものであり、今後の技術協力に大いに役立つことを願うものであります。

昭和55年9月

国際協力事業団

派遣事業部長

河 西 明

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はじめに

本報告は昭和54年1月30日から同年7月29日までの6ヶ月間主としてペブリ教員大学（Petchburi Teachers College, 首都バンコク南西約120軒にある）において行った理科教育（化学）の指導・協力, および訪問した他の十教員大学（タイ国には36の教員大学がある）における指導と討論ならびにタイ国文部省の教員養成局（Department of Teacher Education）の幹部等との教次に亘る話し合いに基づき, タイ国の教員大学における理科教育（化学）の現状と問題点を記述したものである。

I 指導・協力の内容

1 タイ国文部省およびペブリ教員大学への助言

とくに電気・水道などの供給, 現状に適したカリキュラムおよび実験装置などにつき参考資料1にあるような勧告をおこなった。

後述するがバンコク以外では電気・水道の定常的な供給は円滑でなく, 任地のペブリの大学においても停電・断水は日常茶飯事であった。

2 供与機材の使用および保守

今回供与した機材はタイ文部省から要請のあったもので, 細目はA-4フォームの内容に基づき選定した。これらは化学教育を目的とする学生実験用のものである。

3 ペブリ教員大学の教官に対する指導・協力

教官達から, 化学の専門的事項につき多くの質問を受け, また講義実験の項目の選定についても助言を求められた。これらに対し適宜に指導・協力をおこなった。なおカリキュラムは参考資料2に示した通りであり, 学士コースにおける講義内容の程度および講義数などは日本の教員養成系大学のそれらとほとんど同じと考えてよい。

4 卒業論文テーマの選定

学士課程（Degree Level）の学生は各専門分野で卒業研究をおこなう。私の在任中ペブリ教員大学でも化学関係で相当する学生が3名いた。卒業論文テーマの選定につき教官からも協力を依頼され検討した。洗剤中のリンの定量やペブリ付近の河川の水の分析など, 身近な問題を選び, 随時, 相談に与った。

以上が主な事項であるが、ペブリ教員大学では参考資料3の如き具体的計画を用意していた。供与機材の任地での入手期日が6月初旬であったため機材の使用・保守の習熟にやや時間不足であったが、ほぼ先方の要請を満たすことができた。

II タイ国の教員養成

表題については著者がタイ国文部省の教員養成局 (Department of Teacher Education) から入手した "An Introduction to the Department of Teacher Education" (参考資料4) に概要と現状とが詳しく述べられている。したがってこれを参照されたい。

なおタイ国では小・中・高校および教員大学は文部省、小・中・高校のうち都市以外に存在しているものは内務省、総合大学 (国立総合大学の数は13~14ある) は大学庁の三つの全く別な機関に所属している。このほかバンコクに本部を置き八つの都市に分校を持つ総合大学形式の教育大学がある。

III タイ国の教員大学

1 概 要

上記参考資料4 "An Introduction to the Department of Teacher Education" に詳しく述べられている。

2 ペブリ教員大学

参考資料5にペブリ教員大学の概要を記した。

これからわかるように一応3学部制をとっている。また学生数約2000名とあるが、1979年度では短大コースと学士コースのみになり約1000名となる予定である。それ以前にはLower Certificate Levelの学生が別に1000名程度在学していたが、これは廃止された。

a) Higher Certificate と Bachelor's Degree

ペブリ教員大学のみでなく、タイ国のほとんどの教員大学にはHigher Certificate と Bachelor's Degree との二つの課程があり、おのおの二ケ年の修業年限である。学生の大多数は前者に属し、ペブリ教員大学でも7~8割がこれである。

卒業に必要な単位数を下に示した。

	Fundamental	Professional	Specialist	Election	Sum
H. C.	24	24	22	0	70
B. D.	14	18	27	6	65

H.C.の専門の単位22の内、14はmajor, 8はminorの科目である。

B.D.の専門の単位27の内、18はmajor, 9はminorの科目でとる。

b) 科学・化学関係の単位

科学関係ではH.C.において化学5, 物理6, 生物5および一般科学6の合計22単位をとる。またB.D.において化学・物理・生物で各9の27と選択で自然科学以外の科目で6の合計33単位をとる。

化学についてはH.C.の5単位の内、3単位はGeneral Chemistry I (実験を含む), のこり2単位はChemistry of Lifeで取得する。B.D.ではInorganic Chemistry I, Organic Chemistry IおよびPhysical Chemistry Iの各3単位ずつ合計9単位である。これらの内容については参考資料2に示されている。

IV 指導・協力上の留意事項

1 教員大学における研究について

タイ国の教員大学において自然科学関係の研究をおこなうことは非常に困難である。その根本的理由はつぎのことが考えられる。タイ国では教員大学 Teachers College と総合大学 University とを明確に区別しており、設備・研究費などすべての面で格段の差がある。前述の如く機構的にも前者は文部省に、後者は大学庁(文部省と同格)に所属する。

a) 研究機器・設備

訪問した11の教員大学では赤外分光々度計, 紫外分光々度計およびガスクロマトグラフなど日本のどの大学でも所有する基礎的な機器は全くない。一方Chiangmai, Silpakorn およびMahidolなどの各 University ではこれらの機器は勿論, その他の機器が備えられている。したがってUniversity では専門的研究を行いうる体制がほぼ整っている。

b) 研究費

ペブリ教員大学では化学教室の1979年度の研究費は1万バーツ(約10万円)である。一方前記Silpakorn University (Nakorn Pathomにある)のそれは100万バーツ(約1000万円)である。

これらはそれぞれ教室主任のMrs.Siriporn Kongsawad と Dr.Surachai Nimgirawath から直接に聞いたものである。

このような格段の差は他の教員大学と総合大学との間でも同様のようである。したがって前者における研究は、後者のそれと全く異なった種類のもの、たとえば理科教育と関連の深いテーマのものが適当と思われる。

なお化学関係の学会，日本での日本化学会に相当するものがタイ国では未分化である。1979年7月にこの種の学会の設立準備会議が前記Mahidol University(バンコク)にあり，化学系ではチュラロンコン大学と同程度に優秀といわれる)で開催された。これは同会議に出席した文部省教員養成局 Supervisory Unit の Dr. Apichart Suksamrarn から聞いた話である。

2 ガス・電気・水道

タイ国には都市ガスの供給配管はない。すべてのガスは所謂ボンベに充填したブタンなどである。これを実験室でも使用する。

電気は College の存在する場所によっても異なるが昼間の停電がしばしばある。ペブリ教員大学では7月の14日間で昼間停電のない日は2日間であった。

このような電気の状態は断水をしばしば引き起こす。また水圧は定常でなく，水質も悪い。理科教育に必須であるこれら facilities は日本の終戦時，または同直後の状態に近い。研究費の多い総合大学ではこれをカバーするために多少の方策がとれるが，教員大学では困難が多い。

3 教官の質

資格からふれると，タイ国にある36の教員大学の学長で博士号を有する者は私が会った Dr. Muankorn (ピサノロック教員大学)ほかに1名とのことである。一般の教官にはいない。ペブリ教員大学の学長 Saei Kurtcharoen は学士であり，化学教室主任の前記 Mrs. Siriporn (タイ国では first name に Mrs. とか Mr. を付けて呼ぶ)は修士，他の化学教官7名中3名が修士(いずれも女性)，4名が学士(男性1名)であった。ペブリ教員大学に教授・助教授は存在せず，全員が日本の講師またはそれ以下の職であった。しかし総合大学には多数の博士がおり，彼等は大部分が欧米で学位を得た人達で，英語も上手である。なお教員大学にも英語の読み書きのみでなく会話の出来る教官が少からず存在する。しかし日本人と同じく会話の苦手な教官も多い。

文部省にも博士号を持つ者が多数いる。一般的傾向として教員大学で学位(博士)を得た者は文部省入りする様子である。

能力については個人差があり，かなり有能な教官も居る。ペブリ教員大学の化学関係の教官は一般的に実験について不馴れの者が多かった。

化学実験について基礎から教え込むことの必要性を痛感した。

年令的に若い教官が多く，ペブリ教員大学でも学長の50才が最高で，40才は古参に入る。30才台の前半の教官が多かった。

4 供与機材の使用・保守と英文説明書の必要性

供与先の教官達にくり返し練習させ、体で習得させることが肝要である。そうでないと専門家の帰国後に供与機材が放置される可能性が大きい。保守についても同様である。このために英文の説明書は必須である。タイ人は多くの者が英語を読めるが、日本語はほとんど読めない。専門家の在任中は言うまでもなく、帰国後にはこの英文説明書のみが有効なものである。これは必ず作るべきである。

5 夏休みについて

3月中旬から6月初旬までの学校・大学が多い。1982年度までタイ国ではこの期間に in-service のための講義が教員大学でおこなわれる。大学の教官達もこれに動員される。日本流で考えると研究のための時間は十分にあると思われるが、教官の大部分は研究しない。夏休みは休むのが習慣のようである。日本流に仕事をする方式を強制することは得策でない。したがって任期6ヶ月の場合、夏休みは避けることが望ましい。日本の大学の前・後期に亘らぬ派遣期間を考慮すると10月から3月までがよいのではないかと考えられる。この期間では最も暑い4月、5月を避け、最も気候のよい12月、1月がふくまれる。タイ国の新学期は6月から始まり10月までと10月から3月までとの2学期（各18週）と Summer School 8週間がある。

6 学生の質

総合大学へ入学するものが学生の質は最もよい。教員大学学生の質はそれより落ちる。また教員大学間の較差もある。たとえば Chiangmai や Bangkok 市内の2～3の教員大学は質のよい方とのことである。

学生達に対しても日本流の強制は逆効果となろう。またこのような強制には従わないようである。

教官もそうであるが、タイ国の暑い気候に適合した生活様式を乱してもよい結果は得られない。

指導・協力には我慢と忍耐のほか、妥協も必要である。

なおタイ国では中学校と高校とが一つの high school を形成している。多くの生徒・学生はきわめて人なつこく、陽気がかつ先生を敬う気風も強い。

教員大学の H.C. および B.D. 課程への入試課目は人格・興味・一般教養および専門科目（一科目）の4科目（各50分）で、日本のそれとはかなり異なる。

7 その他

a) 仏教

一般の生活では勿論であるが、大学においても仏教は密接に生活と結びついている。たとえばワンカオパンサーには学生達がパレードをしながら自分達の作ったローソクを寺院(ワット)に奉納する。またピティワイクルー(先生を敬う日)にも僧侶を招待して講話を聞き食事も会食するなど、日本人の感覚とは異なった結びつきがある。

b) 習慣

頭をなでることは、きわめて悪いことと聞いていたが、実際には、タイ人も子供の頭をなでる。直接タイ人にこの件につき質問したところ、子供の頭をなでるのは問題でないとのことであった。

V 今後の問題点

昭和54年度タイ国では本プロジェクトによる協力を Tepsatri Teachers College (バンコクのほゞ北、約120kmのLopburiにある)を要請する予定と聞く。

LopburiはPetchburiとほゞ同様な都市とのことで、やゝ同程度がよいというのがタイ文部省の人達の話である。

今後もタイ政府は地方都市にある教員大学の充実を意図している。これまで記述したことがら今後のプロジェクト遂行上、有効な情報を提供することを希望したい。参考までに書くと、本プロジェクトに関して此の種の公式な情報は今まで入手できなかった。

1 タイ側の問題点

タイ文部省で本プロジェクトのA-4フォームを作製する前記Supervisory UnitのDr. Apichart Suksamrarnや教員養成局企画部々長 Dr. Arun Prededilok および同部外事課長 Dr. Chuleo Manilardらと現場のペブリ教員大学の関係教官との間に供与機材品名に関して話し合いが皆無であったということである。この点につき私が申し入れをおこない、54年度分についてはTepsatri教員大学に原案を示し、教官の意見を聞くという手順を踏んだということ Dr. Apichart から直接に聞いた。したがってより有効な協力が期待できよう。

中央の文部省の関係者と、現在の教員大学の教官との実力の差が中央集権と複合し、教員大学での不都合がなかなか改善されないのが現状である。たとえばどこの教員大学にも実験室に小さなドラフトが画一的に置かれているが、これは実際の実験にほとんど使用不可能か、きわめて不便な構造であった。2~3の大学で教官がそれについて不満を洩らしていたが、これらも教官の与り知らぬところで購入の決定がおこなわれている様子である。

これらは発展途上国共通な事象とも思える。

2 指導・協力上の問題点

これまで述べて来たタイ国教員大学の状況から本プロジェクトの指導・協力の内容・程度について具体的なイメージを得られると思う。あまりに専門に深入りした機材などは、その専門家の帰国後は無用の長物となろう。タイ国教員大学の現状から言うと、日本の大学の学部学生（大学院でなく、それよりやや程度の低い）用か、それ以下の程度の機材が適当と思われる。それも薬品ではなく、装置がよい。ペブリ教員大学では薬品は予算での購入が許可されるが、装置については不許可ということを知った。他の教員大学での状態は同じ様子である。

そして供与した機材・装置については、基礎から徹底して教え込む必要がある。ペブリ教員大学の教官達には実験の初歩的技術や、態度が訓練に欠けていることを痛感した。また相互の意志の疎通のための英語について、教員大学の教官の中には会話がきわめて不得意である者も多く、ペブリでも多少不便さを感じた。時間があれば、タイ語を学習してから赴任するのが望ましい。タイ語を話す場合に先方に与える親近感は大きい。これは文部省幹部の英語に堪能な人達にも言えた。日本の青年協力隊に相当する米・英の女性ボランティアは3ヶ月間厳しいタイ語の学習（合宿）を経てペブリ教員大学で教えていた。彼等は会話のみでなく文字も読めた。

3 専門家からの提言

本プロジェクトのより有効な目的達成への手段としてつぎのことを提言したい。

a) 専門家派遣期間は6ヶ月は不十分である。

少なくとも1年以上が望ましい。

b) 供与機材の送付は可能な限り早急におこなう。そうでないとこれらの使用・保守に十分な時間が持たず、結局これらが役に立たないことになる。

タイ国では空送の場合、保管料が船便の10倍かゝり、この支払いの負担が現場の大学にしわよせがくる。したがって、手順よく事を運んで、時間のかゝる船便で送っても支障のないよう処置されることを望む。とくに化学の専門的機材の購入に関しては一般の商社でなく、相当する専門の業者から直接、より安価に迅速に入手し得るよう希望する。

c) 派遣前の現地の見学

事前調査的に、当該専門家などを一週間程度教員大学に派遣する。これにより現地の状態を知り、先方が何を必要としているかを直接判断できる。このためにはその年度の

終りにこの現地見学をおこない、次年度に本番をおこなうなどの措置がとればなおよいであろう。

d) 専門家への事前の情報の提供

本年度以前において、専門家は適切な公式の情報を得ることは不可能であった。すなわち個人的に前回あるいは前々回の派遣専門家から多くの場合口頭で話しを聞く程度であった。

これらは改善するべきで、本プロジェクトに関する公式の情報の提供が望まれる。

e) 供与機材の英文説明書

これは必須である。前にも記したがタイ人は英語の読める者はいるが、日本語の読める者は皆無と言える。

供与機材の日本語の説明書はタイ人にとって無意味である。派遣専門家には役立つが、その帰国後に必ず説明書を必要とする事態が起る。その際日本語のものは役に立たない。機材によってはメーカーの関係で英語のものを付けることが困難なものもあろう。しかし何等かの方法で、何としても英文の説明書をつけるべきである。タイ国滞在中訪問した多くの教員大学、総合大学でタイの教官達から、日本文説明書のみの不都合さを何回も訴えられた。(英文説明書があれば使用できるのに、それが無いから使えないなど)

A Recommendation
for
Science and Chemical Education
at
Petchburi Teachers College

A Recommendation for Science and Chemical Education at Petchburi
Teachers College

Expert in Science Education from JICA Kazuo Taya

I. Preface

This is a recommendation for science and chemical education based on my half year staying at Petchburi Teachers College.

I have studied the chemistry and general science curricula for both higher certificate and bachelor degree in Teachers College in Thailand. I have also studied the actual situation of chemical education and science education of Petchburi Teachers College. Considering the real state of things at the teachers college, especially facilities for experiment, I formulated a recommendation to improve the chemical and science education.

II. Water and Electricity Supply System

In science teaching and research, the constant and sufficient, quantity and pressure, of water and electricity supplies are most essential and fundamental, if the water or electricity suddenly stops or comes in fits and starts in the middle of an experiment, the scientific equipment or instruments will be seriously damaged. Even if this is not so, the experiments have to be stopped and teaching and research will be seriously obstructed. It is possible for teachers to select their teaching subjects or research items which can be carried out without reliable water or electricity supply, however, those subjects or items are limited. This means that suitable and satisfactory chemical and science education can not be done well. So it is a most urgent matter to improve the water and electricity supply systems of this college.

III. Curricula and Laboratory Work

1. General in Chemistry Curricula

The curricula for chemistry in science education is organized to be suitable for students who are expected to be teachers in elementary and junior high schools. The items adopted are practical and closely related with everyday human life.

2. General Chemistry I & II

The General Chemistry I is an introductory curriculum in chemistry and concerned with inorganic chemistry. The General Chemistry II is concerned with physical and organic chemistry. In the laboratory work of General Chemistry I. I recommend that some experimental works in analytical chemistry, particularly qualitative analysis should be adopted. Analytical chemistry is fundamental and essential and useful in recognizing and obtaining knowledge of the properties of materials themselves.

3. Inorganic Chemistry I

This is out of my line, so I can only say that the items treated are rather inclined to theoretical chemistry. It seems they should teach more about the inorganic compounds themselves, eg. properties, reactivity et. al. For this purpose it is desirable to adopt some quantitative analysis in the laboratory work.

4. Organic Chemistry I

A laboratory guide-line should include the following items: recrystallization and determination of freezing point, boiling point, and paper or column chromatography, synthetic reaction eg. preparation of ethyl acetate and acetamide, substitution reaction of aromatics, eg. preparation of nitrobenzene, and extraction of organic compounds from natural products.

Some details of the experiments are described in other papers attached.

5. Physical Chemistry I

This is also a new course at this college in this semester like Organic Chemistry I. The items and some details for the experiments are described in other papers attached.

In the laboratory work of this subject a constant temperature bath in which the temperature change can be controlled within $\pm 0.1^\circ\text{C}$ is desirable. However, a bath with a less accurate temperature change control can be used, if it is not possible to obtain the former. In this case data obtained are not so exact, but they can be made use of for teaching and some rough researches. Many kinds of experiments of physical chemistry can be carried out, eg. measurement of melting-point de-

pression, rate determining of esterification, measurement of neutralization heat, et. al.

A Beckmann thermometer is also desirable to measure the temperature change in those items. The thermometer also can be used for other important experiments in physical chemistry, eg. molecularweight determination by Victor Meyer et. al. In this case a simple thermometer does not give exact data again, but it is enough some purposes if it is graduated in tenth of degree.

參考資料 2

Curriculum of Chemistry

CURRICULUM OF CHEMISTRY

I. OBJECTIVES

1. To provide students with concepts, understanding and ability to teach chemistry at elementary and secondary levels.
2. To make students appreciate the value of chemistry in the economy, the community and the everyday life style of each man.
3. To provide experience for students embarking upon chemistry as a career.
4. To train students to use chemical products efficiently and economically.
5. To have students practice chemical analysis and synthesis procedures.
6. To provide skill in experimenting and discussing their experiments with proper reasoning.
7. To create in students healthy attitudes towards science.
8. To train students to solve problems scientifically.

II. STUDY PROGRAM

Higher Certificate Level

MAJOR: -

MINOR: -

Degree Level

MAJOR: The requirement is a minimum of 20 credits as follows: -

A. Required courses: 15 credits of

Ch 321	Inorganic Chemistry I	3 credits/5 hrs
Ch 331	Organic Chemistry I	3 credits/5 hrs
Ch 341	Physical Chemistry I	3 credits/5 hrs
Ch 422	Inorganic Chemistry II	3 credits/5 hrs
Ch 432	Organic Chemistry II	3 credits/5 hrs

- B. Electives: Select not less than 5 credits of any courses (except those designed as majors of General Science for the Higher Certificate Level).

MINOR: The requirement is a minimum of 15 credits of

- A. Required Courses: 9 credits of

Ch 321	Inorganic Chemistry I	3 credits/5 hrs
Ch 331	Organic Chemistry I	3 credits/5 hrs
Ch 341	Physical Chemistry I	3 credits/5 hrs

- B. Electives: Select any 6 credits from the rest of the chemistry courses (except those designed as majors of General Science for the Higher Certificate Level).

III. COURSE DESCRIPTIONS

Ch 111 GENERAL CHEMISTRY I 3 credits/5 hrs
Basic principles of chemistry; structure of atoms; basic principles of chemical bonding; acid-base theories; periodic table; stoichiometry.

(Both theory and practice)

Ch 212 GENERAL CHEMISTRY II 2 credits/4 hrs
Gaseous state; rate of chemical reaction; introduction to the chemistry of carbon, carbon compounds.

(Both theory and practice)

Ch 321 INORGANIC CHEMISTRY I 3 credits/5 hrs
Ionic compounds; covalent compounds; co-ordination compounds; solid state, metals & alloys; transition metals.

(Both theory and practice)

Ch 331 ORGANIC CHEMISTRY I 3 credits/5 hrs
Definition and history of organic chemistry; structure of atoms and chemical-bonding of organic compounds; classification of organic

compounds; hydrocarbons and certain derivatives; isomerism; stereo-
isomerism; classification of organic reactions of alcohols; phenols;
ethers.

(Both theory and practice)

Ch 341 PHYSICAL CHEMISTRY I 3 credits/5 hrs

Gaseous state and kinetic theory; solid state; liquid state;
phase equilibria; solutions; thermodynamics; thermochemistry; rate of
chemical reactions; electrochemistry.

(Both theory and practice)

Ch 422 INORGANIC CHEMISTRY II 3 credits/5 hrs

Chemical equilibria; quantitative analysis; inorganic sub-
stances in non-aqueous media; qualitative analysis; classification of
chemical substances.

(Both theory and practice)

Ch 432 ORGANIC CHEMISTRY II 3 credits/5 hrs

Aldehydes, ketones, carboxylic acids and derivatives; nitro
compounds; amines; sulfonic acids; heterocyclic compounds; amino acids
and proteins; carbohydrates; polymers.

(Both theory and practice)

Ch 433 ORGANIC CHEMISTRY III 3 credits/5 hrs
(PRE-REQUISITE: Ch 432)

Principles and application of organic spectroscopy; presenta-
tion of organic chemistry principles through natural synthesis of sig-
nificant biological products; new processes in modern organic chemistry.

(Both theory and practice)

Ch 442 PHYSICAL CHEMISTRY II 3 credits/5 hrs

Structure of molecules and molecular spectroscopy; electromag-
netic properties of molecules; physical chemistry of macro-molecules;
nuclear chemistry.

(Both theory and practice)

Ch 451 BIOCHEMISTRY I
(PRE-REQUISITE: Ch 331) 3 credits/5 hrs
Definition of biochemistry; acids, bases and buffers; hydrolysis; the cell and its components; proteins; enzymes; nucleic acids; carbohydrates; lipids.
(Both theory and practice)

Ch 452 BIOCHEMISTRY II
(PRE-REQUISITE: Ch 451) 3 credits/5 hrs
Digestion and absorption; biological oxidation; definition of metabolism; metabolism of carbohydrates, lipids, proteins and nucleic acids; bio-synthesis of nucleic acids and proteins; fluids in human body.

Ch 461 FOOD CHEMISTRY
(PRE-REQUISITE: Ch 331) 3 credits/3 hrs
Study of chemistry and legislation concerning food quality control; chemistry in nutrition; requirements for calories of human beings and animals: carbohydrates, fats, proteins, amino acids, minerals and vitamins.
(Both theory and practice)

Ch 462 APPLIED CHEMISTRY I
(PRE-REQUISITES: Ch 331, Ch 422) 3 credits/3 hrs
Household chemicals: soap, detergent, toothpaste, oils, colors, cosmetics, plastics, food additives, chemicals of current interest, etc. through analysis, quality testing and synthetic method for chemicals of domestic use.

Ch 463 APPLIED CHEMISTRY II
(PRE-REQUISITES: Ch 331, Ch 341 and Ch 422) 3 credits/3 hrs
Production process with emphasis on physical and chemical changes in various types of industry; relation between the quantities of raw materials and their products; determination of composition and quantity of the materials at different stages of the process; the flows of fluids and industrial techniques for high quality and large quantity of production; applications of thermodynamics in industry; the recycling of used or surplus materials.

Ch 471 CHEMISTRY FOR SCIENCE TEACHERS 3 credits/3 hrs

Study investigation and discussion of chemistry curricula and new teaching projects abroad to analyze the objectives, content, instructional and evaluational methods of chemistry teaching programs, with a thorough analysis of main concepts in chemistry of secondary curriculum by students using experimental kits; training in micro-teaching, inquiry-method of teaching; test making; experiment manual; designing and testing of apparatus; construction of simple apparatus.

Ch 472 SCIENCE SEMINAR 2 credits/3 hrs

Individual study of science by making a choice of topic from scientific research journals; presentation of each individual study and discussion; provision of scientific knowledge and skills in experimentation; oral and written reports under instructor's supervision.

Ch 473 INDEPENDENT STUDY IN CHEMISTRY 2 credits/-

Study of a selected topic in chemistry by an individual student, under the close supervision of an instructor. This includes presentation, discussion, suggestion, and generalization in class, with the instructor.

IV. DETAILS OF SUBJECTS

Ch 111 GENERAL CHEMISTRY I

1. Introduction

- 1.1 The science of chemistry
- 1.2 Observation and description
- 1.3 Scientific method
- 1.4 Matter and its properties
- 1.5 The chemical classification of matter
- 1.6 Measurement of matter, significant figures
- 1.7 Separation technique
- 1.8 Matter and energy relation
- 1.9 Energy and chemical change
- 1.10 Water
: physical properties

- : chemical properties
 - : purification of water
 - 1.11 The formation and properties of solution
 - : factor effecting solubility
 - : expression for the concentration of solution
 - 1.12 Colloidal suspension
 - : suspension and emulsion
 - : application of environment
 - 1.13 Oxygen
 - : spontaneous reaction (combustion)
 - 2. Electronic structure of atoms
 - 2.1 The particles in atom, atomic weight
 - 2.2 Electronic configuration
 - 2.3 Bohr atomic Theory
 - 3. Chemical bond
 - 3.1 Ionic bond (ionization energy, electron affinity)
 - 3.2 Covalent bond
 - : polar, nonpolar covalent
 - 3.3 Hydrogen bond
 - 3.4 Metallic bond
 - 4. Acids and bases
 - 4.1 Acid - base theory
 - : Arrhenius concept
 - : Broensted - Lowry concept
 - : Lewis concept
 - 4.2 Measurement of acid - base strength
 - 4.3 Ionization of acid - base
 - 4.4 pH and pKa of acid - base system
 - 4.5 Titration curve of acid - base system
 - 4.6 Indicators
 - : selection of indicator for acid - base system
 - 4.7 Hydrolysis of salts
 - 5. Periodicity
 - 5.1 Historical development of an awareness of periodicity
 - 5.2 The periodic law and the periodic table
 - 5.3 Modern periodic table

- 5.4 Atomic structure and periodic properties of atoms
 - 5.4.1 Size of atoms and ions
 - 5.4.2 Bond lengths and bond distances
 - 5.4.3 Covalent radius
 - 5.4.4 Crystal (ionic) radius
 - 5.4.5 Ionization potential energy
 - 5.4.6 Electron affinity
 - 5.4.7 Electronegativity
 - 5.4.8 Oxidation number
- 5.5 The representative elements (group IA - VIIA and their compounds; oxide, sulphate, chloride etc.)
- 6. Stoichiometry
 - 6.1 Chemical laws
 - 6.2 Molecular formula and molecular weight
 - 6.3 Mole concept
 - 6.4 Chemical equation (redox and nonredox reaction)
 - 6.5 Stoichiometric calculation
 - 6.6 Galvanic cells
 - 6.7 Electrolysis
 - 6.8 Electroplating and corrosion

Ch 212 GENERAL CHEMISTRY II

- 1. The gaseous state
 - 1.1 Measurable properties of gasses. (weight and number of molecules, pressure exerted by a gas, the volume occupied by a gas)
 - 1.2 The kinetic molecular theory of gasses
 - 1.2.1 Boyle's law.
 - 1.2.2 Charles' law and Gay-Lussacs' law.
 - 1.2.3 Avogadro's law.
 - 1.2.4 Gay-Lussac's law of combination volume.
 - 1.2.5 Dalton's law of partial pressure.
 - 1.2.6 Diffusion of gasses, Graham's law.
- 2. Chemical kinetics
 - 2.1 General consideration on the rate of chemical reactions
 - 2.2 The reaction rate.

- 2.2.1 Reaction order and rate law
- 2.3 Factors affecting reaction rates
 - 2.3.1 Temperature
 - 2.3.2 Concentration
 - 2.3.3 Catalyst
- 3. Introduction to chemistry of carbon and carbon compounds
 - 3.1 Classification of organic compounds
 - 3.1.1 Hydrocarbons (alkanes, alkenes)
 - 3.1.2 Petroleum and fuels.
 - 3.2 Some properties of alcohols, aldehydes, ketones, carboxylic acids, amines, amino acids.
 - 3.3 Application of carbon compounds; polymers:
 - 3.4 Carbohydrates and Lipids
 - 3.5 Proteins and Nucleic acids
 - 3.6 Enzymes
 - 3.7 Chemistry in health and medicine
 - 3.8 Fertilizers & Pesticides
 - 3.9 Soaps and detergents.

Ch 321 INORGANIC CHEMISTRY

- 1. Ionic compounds
 - 1.1 Common structure of ionic crystal
 - 1.1.1 NaCl crystal
 - 1.1.2 CsCl crystal
 - 1.1.3 CaF₂ crystal
 - 1.1.4 Rutile (TiO₂) crystal
 - 1.1.5 Zinc blende (cubic ZnS) crystal
 - 1.1.6 Wurtzite (hexagonal ZnS) crystal
 - 1.2 Properties of ionic substance
 - 1.2.1 Conductivity
 - 1.2.2 Boiling point and melting point
 - 1.2.3 Hardness trends
 - 1.2.4 Solubility
 - 1.3 Ionic radii
 - 1.3.1 Pauling univalent radii (with calculation)
 - 1.3.2 Pauling crystal radii

- 1.4 Radius ratio effect
 - 1.4.1 Calculation of cation - anion ratio and interpretation of geometry and possible lattice structure
- 1.5 Lattice energy
 - 1.5.1 Born exponent
 - 1.5.2 Madelung constant
 - 1.5.3 Born equation (calculation of lattice energy)
- 1.6 Born - Haber cycle
 - 1.6.1 Use of Born - Haber cycle to calculate sublimation energy, dissociation energy and heat of formation
- 1.7 Defect structure of ionic crystals
2. Covalent compounds.
 - 2.1 Oxidation state and formal charge
 - 2.2 Resonance
 - 2.3 Simple rule for covalent bond formation
 - 2.4 Theories of the covalent bond
 - 2.4.1 Pauling and Slater valence bond theory (VBT)
 - : hybridization
 - : Valence shell electron - pairs repulsion theory (VSEPR), prediction shape of molecules.
 - : criterion of bond strength, bond angle determinations
 - : bond form between hybrid orbital e.g. sigma and pi bonds
 - 2.5 Molecular orbital theory (MOT)
 - : LCAO, Linear combination of atomic orbital, wave functions
 - : bonding MO
 - : MOT approach to sigma and pi bondings
 - : molecular orbital energy level diagrams
- 2.6 Electronegativity determination
 - 2.6.1 Pauling electronegativity
 - 2.6.2 Milliken electronegativity
- 2.7 Partial covalent bond character and electronegativity
 - 2.7.1 Dipole moment of molecule

- 2.7.2 Fajans' rule for the prediction of relation nonpolar character.
- 2.8 Radii of atom in covalent compounds.
- 2.9 Properties of covalent substances.
 - 2.9.1 Conductivity
 - 2.9.2 Boiling point and melting point
 - 2.9.3 Solubility
- 3. Coordination compounds
 - 3.1 Systematic nomenclature of coordination compounds
 - 3.2 Atomic state and term symbols:
 - : Russel - Saunder coupling (L - S coupling)
 - 3.3 Theories of the coordinate bond in metal complexes
 - 3.3.1 Valence bond theory (V B T)
 - 3.3.2 Crystal field theory (C F T) or Ligand field theory
 - 3.3.3 Jahn Teller distortion of complexes
 - 3.3.4 Molecular orbital theory (M O T)
 - 3.3.5 Stereoisomerism of coordination compounds
 - 3.3.6 Reaction of coordination compounds
 - 3.3.7 Complex ion stability
- 4. Solid state, metals and alloys
 - 4.1 Macroscopic properties of solids : crystal sizes and shapes
 - 4.2 X - ray and crystal structure
 - : electromagnetic wave
 - : wave interference
 - 4.3 Crystalline system
 - : type of crystalline system, e.g. cubic, tetragonal Orthorhombic etc.
 - 4.4 Common crystal lattices.
 - : simple cubic
 - : body center cubic
 - : hexagonal closest packing or face centered cubic close packing
 - 4.5 Bonding in metals.
 - : valence bond theory of the metallic bond
 - : molecular orbital approach to the bond theory
 - : free electron theory of metals.
 - 4.6 Insulators, conductors and semi conductors.

- 4.7 Magnetic properties of metals.
- 4.8 Alloy
 - : classification of alloy
 - : phase rule (one component systems and two components systems)
- 5. The transition metals.
 - 5.1 General properties of the elements.
 - 5.2 The scandium family.
 - 5.3 The titanium family.
 - 5.4 The vanadium family.
 - 5.5 The chromium family.
 - 5.6 The manganese family.
 - 5.7 Iron, cobalt and nickel.
 - 5.8 Copper, silver and gold.
 - 5.9 Zinc, cadmium and mercury.

Ch 331 ORGANIC CHEMISTRY I

- 1. Introduction
 - 1.1 History of organic chemistry
 - 1.2 Structure of atom and bond in organic chemistry
 - 1.2.1 Atomic structure
 - : orbitals
 - : electronic configuration
 - 1.2.2 Covalent bond
 - : hybridization
 - : polarity of bond
 - : molecules
 - 1.2.3 Intermolecular forces
- 2. Classification

Functional groups, hydrocarbons (alkanes, alkenes, alkynes, aromatic), alcohols, ethers, aldehydes, ketones, carboxylic acids, ethers, amines, amides, nitriles, acid anhydrides, acid chlorides
- 3. Hydrocarbons and derivatives
 - 3.1 Aliphatic and aromatic compounds
 - 3.1.1 Aliphatic hydrocarbons (open chain and cyclic)
 - : alkanes
 - : alkenes and dienes

- 7.5 Reactions
- 7.6 Use
- 8. Ethers
 - 8.1 Structure
 - 8.2 Nomenclature
 - 8.3 Preparation
 - 8.4 Physical properties
 - 8.5 Reactions
 - 8.6 Use

Laboratory Works

- 1. Recrystallization and solubility
 - : Salicylic acid, acetanilide, m - dinitrobenzene, naphthalene, vanillin
- 2. Determination of m.p. and b.p.
 - : Acetanilide, naphthalene
 - : Hexane, methanol, toluene, carbon tetra chloride
- 3. Chromatography
 - 3.1 Paper chromatography
 - 3.2 Column chromatography
- 4. Laboratory for some type of reactions
 - 4.1 Substitution reaction
 - : nitrobenzene
 - 4.2 Addition reaction
 - : addition of bromine to alkenes
 - 4.3 Oxidation reaction
 - : side chain oxidation of benzene derivative, oxidation of toluene with KMnO_4
 - 4.4 Elimination reaction
 - : dehydration, dehalogenation
 - 4.5 Aliphatic hydrocarbons
 - : CH_4 , C_2H_4 , C_2H_2
- 5. Alcohols
 - 5.1 Solubility
 - 5.2 Ethanol

- 5.3 Oxidation
- 5.4 Dehydration
- 6. Phenols
 - 6.1 Solubility
 - 6.2 Reaction with FeCl_3
 - 6.3 Reaction with bromine

Ch 341 PHYSICAL CHEMISTRY I

- 1. Gaseous state
 - 1.1 Ideal gas
 - 1.2 Real gas
 - 1.3 The kinetic theory of gas
- 2. Solid state
 - 2.1 Properties of solid
 - 2.2 Structure of solid
 - 2.3 The symmetry of crystals
 - 2.4 The designation of crystal planes and phase
 - 2.5 X-rays and X-rays diffraction
- 3. Liquid state
 - 3.1 Theory of liquid
 - 3.2 Vapour pressure of liquid
- 4. Phase equilibria
 - 4.1 Phase rule
 - 4.2 Phase diagram
- 5. Solutions
 - 5.1 Kinds of solution
 - 5.2 Ideal solution
 - 5.3 Colligative properties
 - 5.4 Vapour pressure
 - 5.5 Elevation of boiling point
 - 5.6 Depression of freezing point
 - 5.7 Osmotic pressure
 - 5.8 Dissociation and association in nonideal solution
- 6. Thermodynamics
 - 6.1 System and surroundings and heat
 - 6.2 Energy and the first law of thermodynamics

- 6.3 The second law of thermodynamics
- 6.4 The third law of thermodynamics
- 7. Thermochemistry
 - 7.1 Heat of reaction
 - 7.2 Enthalpy and enthalpy change
- 8. Chemical kinetics
 - 8.1 Collision theory
 - 8.2 Theory of reaction rate
 - 8.3 Order of reaction
- 9. Electrochemistry
 - 9.1 Conductivity
 - 9.2 Transport number and mobility
 - 9.3 Diffusion and ionic mobility
 - 9.4 Mobility of hydrogen and hydroxyl ions
 - 9.5 Activity and standard state
 - 9.6 Activity coefficient
 - 9.7 Debye-Huckel theory
 - 9.8 The Posisson-Boltzman equation
 - 9.9 Acid - base
 - 9.9.1 Dissociation constant of acid - base
 - 9.9.2 Kinetics of ionic reaction and salt effect
 - 9.9.3 Ionic reaction mechanism
 - 9.9.4 Acid - base catalysis
 - 9.10 Electrochemical cell

Laboratory Works (elective)

- 1. Determining characteristics of substance (specific gravity and Ref. active index)
- 2. Heat of Solution
- 3. Heat of neutralization
- 4. Charle's Law
- 5. Boyle's Law
- 6. Rate of reaction (influence of concentration)
- 7. Order of reaction
- 8. Determination the M.W. by depression of f.p.

9. Determination of M.W. by b.p. elevation
10. Osmotic pressure
11. Ionic mobility
12. Determination of the molecular weight of volatile liquid
13. Determination of E.M.F.
14. Distribution of a solute between immiscible solvents
15. Determination of pKa by using universal indicator

Ch 442 PHYSICAL CHEMISTRY II

1. Molecular structure and spectroscopy
 - 1.1 Rotational spectra
 - 1.2 Vibrational spectra
 - 1.3 Rotation-vibration spectra
 - 1.4 Raman spectroscopy
 - 1.5 Electronic spectra
 - 1.6 Electronic energies of polyatomic molecules
 - 1.7 The energy levels of nuclei in magnetic fields
 - 1.8 Nuclear magnetic resonance (NMR) spectroscopy
 - 1.9 Chemical shifts and nuclear magnetic interactions
 - 1.10 Electron spin resonance (ESR) spectroscopy
2. Electrical and Magnetic properties of molecules
 - 2.1 Dipole moments of molecules
 - 2.2 Basic electrostatic ideas
 - 2.3 Electrostatics for dielectric media
 - 2.4 The Molecular basis for dielectric behaviour
 - 2.5 Determination of dipole moment and molecular polarizability
 - 2.6 Dipole moments and ionic character
 - 2.7 Bond moments
 - 2.8 Magnetic molecular properties
 - 2.8.1 Diamagnetism
 - 2.8.2 Paramagnetism
3. Macromolecules
 - 3.1 Types and sizes of particles
 - 3.2 Synthetic polymers
 - 3.3 Proteins
 - 3.4 Nucleic acids

- 3.5 The polysaccharides
- 3.6 The polyisoprenes
- 3.7 Molecular masses of polymers
- 3.8 Osmotic pressure determinations of macromolecular masses
- 3.9 Ion-exchange chromatography
- 3.10 Diffusion
- 3.11 Sedimentation and the ultracentrifuge
- 3.12 Viscosity
- 3.13 Light scattering
- 3.14 The Structure of proteins
- 3.15 The structure of nucleic acids
- 3.16 Crystallinity of high polymers
- 3.17 Electron microscopy
- 4. Nuclear Chemistry
 - 4.1 Particle tracking
 - 4.2 Artificial disintegration of atomic nuclei
 - 4.3 Particle accelerators
 - 4.4 Neutron
 - 4.5 Positron and mesons
 - 4.6 Elementary particles
 - 4.7 Beta decay and the neutrino
 - 4.8 Nuclear forces
 - 4.9 Neutrons and nuclei
 - 4.10 Structure of the nucleus
 - 4.11 Nuclear reactions
 - 4.12 Nuclear fissions
 - 4.13 Transuranic elements
 - 4.14 Nuclear chain reactions
 - 4.15 Stellar energy
 - 4.16 Nuclear fusion
 - 4.17 Lighter radioactive nuclides
 - 4.18 Atomic energy and application

Laboratory Works

1. Infra-red spectrum of CO_2
2. Dielectric constant of solid
3. Viscosity of High-polymer solutions
4. Osmotic pressure of high-polymer solution
5. Diffusion
6. Ion-exchange chromatography
7. Exchange reaction of ammonium sulfate with D_2O

Ch 422 INORGANIC CHEMISTRY II

1. Chemical equilibria
 - 1.1 The law of mass action
 - 1.2 Relation between the free energy change and the equilibrium constant
 - 1.3 Equilibrium in solutions
 - 1.4 Iones equilibria
 - 1.4.1 Ionization equation involving weak acid and weak base
 - 1.4.2 Ionization of water
 - 1.4.3 pH scale
 - 1.4.4 Polyprotic acids
 - 1.4.5 The common - ion effect
 - 1.4.6 Buffer solution
 - 1.4.7 Preparation of buffer solution
 - 1.4.8 Hydrolysis, K_h
 - 1.4.9 Solubility product and precipitation
 - 1.4.10 Solubility product and precipitation
 - 1.4.11 Equilibria of complex ions
2. Introduction to quantitative chemistry
 - 2.1 Chemical analysis methodology
 - 2.2 Gravimetry
 - 2.2.1 Nature of the method and equipments
 - 2.2.2 Laboratory techniques and calculation
 - 2.3 Volumetry
 - 2.3.1 Nature of the method and equipments
 - 2.3.2 Laboratory techniques and calculation
 - 2.4 Titrimetry
 - 2.4.1 Nature of the method and equipments
 - 2.4.2 Laboratory techniques and calculation
 - 2.4.3 Classification of titrimetric methods
 - : neutralization titration, e.q. acid-base titration
 - : precipitation titrations, e.q. precipitation equilibria, indicator for precipitation titration
 - : complex formation titrations
 - : redox titration

3. Inorganic substances in nonaqueous mediums
 - 3.1 The properties of ionizing solvents
 - 3.2 Classification of solvents
 - 3.3 Liquid ammonia as a solvent
 - 3.4 Solutions of metals in liquid ammonia
 - 3.5 Reactions in liquid ammonia
 - 3.5.1 Acid-base reactions
 - 3.5.2 Redox reactions
 - 3.5.3 Precipitation reactions
 - 3.5.4 Complex formations
 - 3.6 Liquid hydrogen fluoride as a solvent
 - 3.7 Reaction in liquid hydrogen fluoride
 - 3.8 Liquid sulfur dioxide as a solvent
 - 3.9 Reaction in liquid sulfur dioxide
 - 3.9.1 Acid-base reactions
 - 3.9.2 Redox reaction
 - 3.9.3 Precipitation reactions
 - 3.9.4 Complex formations
 - 3.9.5 Solvolysis reactions
 - 3.10 Acetic acid as a solvent
 - 3.11 Reaction in acetic acid
 - 3.12 Other nonaqueous solvent
4. Introduction to qualitative analysis
 - 4.1 principles of qualitative analysis
 - 4.2 The semimicroplan of qualitative analysis
 - 4.3 analysis for anions
 - 4.4 analysis for cations
 - 4.4.1 Group 1: The silver group (Ag, Pb, Hg)
 - 4.4.2 Group 2: The copper arsenic group (Cu, Hg, Pb, As)
 - 4.4.3 Group 3: Al, Cr, Ni, Fe
 - 4.4.4 Group 4 and 5: Ca, Ba, Mg, Na, NH_4^+
5. Separation and purifications methods in chemistry
 - 5.1 Criterion of purity
 - 5.2 Chromatographic methods
 - 5.2.1 Introduction
 - 5.2.2 Solid-liquid absorption chromatography

- 5.2.3 Liquid partition chromatography
- 5.2.4 Gas chromatography
- 5.2.5 Ion-exchange chromatography
- 5.2.6 Electro chromatography
- 5.3 Non chromatographic methods
 - 5.3.1 Introduction
 - 5.3.2 Flootation
 - 5.3.3 Sedimentation
 - 5.3.4 Zone refining

Laboratory Works

1. Election from the followings.
 1. Equilibria in chemical reaction : the principle of Le Chatelier
 2. Acid-base equilibria, indicators
 3. Reversible reaction and chemical equilibrium
 4. The equilibria of water, weak acids and weak bases, indicators
 5. The ionization constant of some weak acid
 6. The equilibria between slightly soluble salts and their ions
 7. The equilibrium of coordination compounds hydration, complex ions, slightly soluble metal hydroxides
 8. Acid-base equilibria: hydrolysis, buffers
 9. The Equilibria of carbonic acid and its salts
2. Chemical Analysis
 1. Gravimetry
 - 1.1 Determination of water in barium chloride hydrate or $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
 - 1.2 Determination of chlorine in a soluble chloride
 2. Titrimetry
 - 2.1 Neutralization methods
 - 2.1.1 Preparation of standard acid and base
 - 2.1.2 Determination of talkaline content of soda ash
 - 2.2 Precipitation methods
 - 2.2.1 precipitation of a standard solution of silver nitrates
 - 2.2.2 Fajans determination of chlorine

- 2.3 Redox methods
 - 2.3.1 Titration with KMnO_4
 - 2.3.2 Titration with $\text{K}_2\text{Cr}_2\text{O}_7$
 - 2.3.3 Iodometric titration
- 2.4 Complex titration
 - 2.4.1 Determination of nickel
 - 2.4.2 E D T A titration

3. Others

- 1. Adsorption and exchange
- 2. Instrumental experiments

Ch 432 ORGANIC CHEMISTRY II

1. Aldehydes and ketones

- 1.1 Structure
- 1.2 Nomenclature
- 1.3 Preparation
 - 1.3.1 Preparation of aldehydes
 - 1.3.2 Preparation of ketones
- 1.4 Physical properties
- 1.5 Reactions
- 1.6 Use

2. Carboxylic acids and derivatives

- 2.1 Carboxylic acids
 - 2.1.1 Structure
 - 2.1.2 Nomenclature
 - 2.1.3 Preparation
 - 2.1.4 Physical Properties
 - 2.1.5 Reactions
 - 2.1.6 Use
- 2.2 Derivatives of carboxylic acids
 - 2.2.1 Esters
 - 2.2.2 Acid chlorides
 - 2.2.3 Acid anhydrides
 - 2.2.4 Amides
 - 2.2.5 Nitriles

3. Nitro compounds
 - 3.1 Structure
 - 3.2 Nomenclature
 - 3.3 Preparation
 - 3.3.1 Nitromethane
 - 3.3.2 Nitroglycerine
 - 3.3.3 Nitrobenzene
 - 3.3.4 Trinitro benzene
 - 3.4 Physical properties
 - 3.5 Reactions
 - 3.6 Use
4. Amines
 - 4.1 Structure
 - 4.2 Classification
 - 4.3 Nomenclature
 - 4.4 Preparation
 - 4.4.1 Methylamine
 - 4.4.2 Dimethylamine
 - 4.4.3 Trimethylamine
 - 4.4.4 Aniline
 - 4.5 Physical properties
 - 4.6 Reaction
 - 4.7 Use
 - 4.8 Diazonium salts
5. Sulfonic acids
 - 5.1 Sulfonic acids
 - 5.1.1 Structure
 - 5.1.2 Nomenclature
 - 5.1.3 Preparation
 - 5.1.4 Physical properties
 - 5.1.5 Reaction
 - 5.1.6 Use
 - 5.2 Derivatives of sulfonic acids
 - 5.2.1 Sulfonyl chlorides
 - 5.2.2 Sulfonamides

6. Heterocyclic compounds
 - 6.1 Furan, pyrrole, and thiophene
 - 6.2 Pyridine, quinoline, isoquinoline
 - 6.3 Pyrimidines and purines
7. Amino acids and proteins
 - 7.1 Structure
 - 7.2 Classification
 - 7.3 Nomenclature
 - 7.4 Preparation of amino acids
 - 7.5 Physical properties
 - 7.6 Reaction
 - 7.7 Use
 - 7.8 Peptide synthesis
 - 7.9 Structure of Peptides and Proteins
8. Carbohydrates
 - 8.1 Structure
 - 8.2 Classification
 - 8.3 Nomenclature
 - 8.4 Glucose
 - 8.5 Other Monosaccharides
 - 8.6 Preparation
 - 8.7 Reaction
 - 8.8 Oligosaccharides
 - 8.9 Polysaccharides
9. Polymers
 - 9.1 Basic concepts of polymer chemistry
 - 9.2 General properties
 - 9.3 Preparation
 - 9.4 Use

Laboratory Works

1. Study of aldehydes and ketones
 - 1.1 Oxidation
 - 1.2 Reaction with schiff's reagent
 - 1.3 Nucleophilic addition
 - 1.4 Condensation reaction

2. Carboxylic acids
 - 2.1 Reaction with bases
 - 2.2 Preparation of esters, e.g. ethyl acetate
 - 2.3 The property of formic acid as a reducing agent
3. Acid derivatives
 - 3.1 Ester hydrolysis, amide hydrolysis
 - 3.2 Reaction with acid anhydride and alcohol
 - 3.3 Reaction with amide and NH_2
4. Detection of elements contained in organic compounds
 - 4.1 Sulfur
 - 4.2 Nitrogen
 - 4.3 Halogen
5. Classification test
 - 5.1 Unsaturated compounds
 - 5.2 Aldehydes and ketones
 - 5.3 Carboxylic acids
 - 5.4 Phenolic compounds
6. Preparation of nitrobenzene
7. Quarternary salt of amine
8. Bromination of aniline
9. Preparation of sulfa drugs
10. Preparation of aspirin
11. Sugars
 - 11.1 Reduction and oxidation
 - 11.2 Reaction with phenylhydrazine, osazones
12. Preparation of phenol-formaldehyde resin

Ch 451 BIOCHEMISTRY I

1. Scope
 - 1.1 Remarks about biochemistry
 - 1.2 Buffer solution
 - 1.3 Hydrolysis
 - 1.4 The cell and its components
 - 1.4.1 Cell membrane
 - 1.4.2 Cell wall
 - 1.4.3 Cytoplasm

- 1.4.4 Nucleus
 - 1.4.5 Mitochondria
 - 1.4.6 Endoplasmic reticulum
 - 1.4.7 Ribosome
 - 1.4.8 Chloroplast
 - 1.4.9 Lysosome
 - 1.4.10 Vacuole
 - 1.4.11 Capsule
2. Protein
- 2.1 The importance of protein to living things
 - 2.2 Classification, properties, structure and chemical reaction of amino acid
 - 2.3 Classification, properties, structure, chemical reaction isolation and purification of protein
 - 2.4 Hormones
3. Enzymes
- 3.1 Nature of enzyme, nomenclature, classification and specificity
 - 3.2 Enzyme kinetics, Michaelis-Menten equation
 - 3.3 Factors affecting the velocity of enzyme catalyzed reaction
 - 3.4 Inhibitors
 - 3.5 Activators
 - 3.6 Prosthetic groups and coenzymes (water soluble vitamins)
 - 3.7 Localization and isolation of enzyme
 - 3.8 Enzyme mechanism
 - 3.9 Enzyme regulation
4. Nucleoproteins and nucleic acids
- 4.1 Nature of nucleoproteins, nucleic acids, nucleotide and nucleoside
 - 4.2 Components of nucleic acids
 - 4.3 Bases
 - 4.4 Sugars
 - 4.5 Structure of nucleic acid (DNA & RNA)
5. Carbohydrates
- 5.1 Nomenclature, classification, formulation, stereochemistry and chemical reactions
 - 5.1.1 Monosaccharides

5.1.2 Oligosaccharides

5.1.3 Polysaccharides

5.2 Technique of test for carbohydrates

6. Lipids

6.1 Remarks about lipids

6.2 Classification of lipids

6.2.1 Fatty acids

: nomenclature, structure and stereochemistry

: general properties (physical properties)

: chemical properties

6.2.2 Neutral fats (triglycerides)

: structure and chemical reaction

6.2.3 Waxes

6.2.4 Phospholipids

6.2.5 Sphingolipids

6.2.6 Steroids

: cholesterol

: hormones

6.2.7 Fat-soluble vitamins (A, D, E, K)

Laboratory Works

1. pH Measurement of solution (acids, bases, urine etc.)
 - 1.1 Glass electrode (pH meter)
 - 1.2 Indicators (paper and solution)
2. Henderson-hasselbalch equation acetate buffer phosphate buffer
3. Detection of protein (albumen)
 - 3.1 Solubility in water, 95% alcohol, HCl(dil), NaOH(dil)
 - 3.2 Color reactions of reactions
 - 3.2.1 Millon's reactions
 - 3.2.2 Xanthoproteic reaction
 - 3.2.3 Hopkins-Cole reaction
 - 3.2.4 Biuret reaction
 - 3.2.5 Ninhydrin reaction
 - 3.3 Precipitation reaction
 - 3.3.1 Strong acid and alkali
 - 3.3.2 Metallic salts e.g. dil HgCl₂, Pb(CH₃COO)₂, AgNO₃, CuSO₄, FeCl₃
 - 3.3.3 Alkaloidal reagents e.g. picric acid, trichloroacetic acid, tannic acid, phosphotungstic acid and trichloroacetic acid
 - 3.3.4 Salting out of protein by (NH₄)₂SO₄
4. Detection of amino acid
 - 4.1 Solubility in water, 95% alcohol, HCl(dil), NaOH(dil)
 - 4.2 Color reactions of proteins
 - 4.2.1 Hoffmann reaction (tyrosine)
 - 4.2.2 Hopkins-cole test (tryptophan)
 - 4.2.3 Nitroprusside test (sulphydryl group of amino acid)
 - 4.2.4 Folin's test (tyrosine, tryptophan)
 - 4.3 Paper chromatography
5. Detection of protein in milk
6. Enzyme activity (enzyme ptyalin)
 - 6.1 Powder of enzyme ptyalin
 - 6.2 Agent influencing of enzyme activity
 - 6.2.1 Temperature

6.2.2 Acids and alkalis

7. Detection of monosaccharides and disaccharides
 - 7.1 Molisch's test (d-naphthol reaction)
 - 7.2 Phenylhydrazine test (osazone test)
 - 7.3 Reduction test
 - 7.3.1 Fehling's test
 - 7.3.2 Benedict's test
 - 7.3.3 Barford's test
 - 7.4 Color test for pentoses
 - 7.4.1 Tauber's benzidine test
 - 7.4.2 Bial's orcinol hydrochloric acid reaction
 - 7.4.3 Aniline test
 - 7.5 Color test for ketohexose
 - 7.5.1 Selivanoff's test (resorcinol test)
 - 7.5.2 Fermentation test
8. Detection of polysaccharides (starch)
 - 8.1 Microscopic examination
 - 8.2 Solubility in hot and cold water
 - 8.3 Iodine test
 - 8.4 Reduction test with Fehling's and Benedict's reagent
 - 8.5 Cellulose (filter paper, absorbent cotton and cleansing tissue)
 - 8.6 Solubility in water, aqueous HCl and NaOH and CS₂
 - 8.7 Reduction test
9. Identification of unknown carbohydrates
 - 9.1 Monosaccharides
 - 9.2 Disaccharides
10. Detection of lipids (olive oil, lard and fatty acids)
 - 10.1 Solubility in water, dil. acid, dil. alkali, cold and hot alcohol, benzene, chloroform, ether and carbon tetrachloride
 - 10.2 Microscopic examination of fat crystals (lard)
 - 10.3 Reaction of fresh and rancid oils with litmus
11. Emulsification
12. Saponification of fat and determination of saponification number

Ch 452 BIOCHEMISTRY II

1. Digestion and absorption from the gastrointestinal tract
 - 1.1 Digestion in the mouth
 - 1.2 Digestion in the stomach
 - 1.3 Pancreatic and intestinal digestion
 - 1.4 The bile
 - 1.5 Absorption of carbohydrate
 - 1.6 Absorption of fats
 - 1.7 Absorption of amino acids
2. Biological oxidation
 - 2.1 The free energy of oxidation-reduction reaction
 - 2.2 High energy compounds e.g. ATP, creatine phosphate, carbamyl phosphate
 - 2.3 Formation of ATP
 - 2.3.1 At the substrate level
 - 2.3.2 Through oxidative phosphorylation (respiratory chain)
3. Metabolism
 - 3.1 Remarks of metabolism
 - 3.2 Metabolism of carbohydrates mechanism, enzymes, regulation and localization
 - 3.2.1 Glycolysis (embden-meyerhof pathway)
 - 3.2.2 Krebs' cycle (tricarboxylic acid cycle)
 - 3.2.3 Glycogenesis
 - 3.2.4 Glycogenolysis
 - 3.2.5 The hexose monophosphate shunt (pentose phosphate cycle)
 - 3.2.6 Gluconeogenesis
 - 3.2.7 Photosynthesis
 - 3.3 Metabolism of lipids (enzyme, regulation and localization)
 - 3.3.1 Oxidation of fatty acids
 - 3.3.2 Oxidation of even-numbered fatty acids (beta oxidation)
 - 3.3.3 Oxidation of odd-numbered and branched-chain fatty acid
 - 3.3.4 Biosynthesis of lipids (fatty acids)
 - 3.3.5 Ketogenesis
 - 3.3.6 Fatty livers
 - 3.4 Metabolism of protein (enzyme mechanism, regulation and localization)

- 3.4.1 Metabolism of the amino group
- 3.4.2 Transamination
- 3.4.3 Oxidative deamination
- 3.4.4 Ammonia transport
- 3.4.5 Urea cycle
- 3.4.6 Other products of nitrogen metabolism
 - uric acid
 - creatine and cratinine
- 3.5 Metabolism of nucleic acids
 - 3.5.1 Catabolism of purine and pyrimidine
 - 3.5.2 Biosynthesis of nucleic acid
- 4. Biosynthesis of nucleic acid and protein
 - 4.1 Replication and transcription of DNA
 - 4.2 Translation of protein
 - 4.3 The genetic code
 - 4.4 Utilization of amino acids for protein synthesis
 - 4.5 Inhibitor of protein biosynthesis
 - 4.6 Regulation of protein biosynthesis (the theron concept)
- 5. Body fluids
 - 5.1 Water metabolism
 - 5.1.1 Body water and its distribution
 - 5.1.2 Extracellular fluid
 - 5.1.3 Intracellular fluid
 - 5.2 Blood
 - 5.2.1 Composition of blood
 - 5.2.2 Enzyme in blood
 - 5.2.3 Mechanism of blood clotting
 - 5.2.4 Hemoglobin
 - 5.3 Lymph -chemical composition of lymph
 - 5.4 Cerebrospinal fluid
 - chemical composition of cerebrospinal fluid
 - 5.5 Sweat -chemical composition of sweat
 - 5.6 Tears -chemical composition of tears
 - 5.7 Urine
 - 5.7.1 Formation of urine
 - 5.7.2 Composition of urine

Laboratory Works

1. Salivary digestion
 - 1.1 Acid-base reaction of saliva
(test the reaction of the filtered saliva by pH paper)
 - 1.2 Test its solubility in water, dilute acid and alkali
 - 1.3 Test for protein in saliva
(by color reaction - Million's reaction and Biuret test)
 - 1.4 Test for chloride
 - 1.5 Comparison of the digestive activity of dialysed and whole saliva
2. Bile
 - 2.1 General properties of bile (color, odor, reaction to litmus)
 - 2.2 Test for bile pigments (Gmelin's test, Fouchet's test)
 - 2.3 Surface tension test (Hay's test)
 - 2.4 Influence of bile on digestion of fats
3. Blood
 - 3.1 Determination of specific gravity of whole blood and plasma
(copper sulfate method)
 - 3.2 Formation of crystalline derivatives of hemins
(Hemin crystals, hemichromogen test)
 - 3.3 Color test (guaiac test, benzidine test)
4. Urine I
 - 4.1 General characteristics of normal urine (volume color, pH, specific gravity and solid content surface tension)
 - 4.2 Quantitative determination of titratable acidity of urine
5. Urine II
 - 5.1 Detection of glucose (Benedict's test and Fehling's test)
 - 5.2 Detection of protein
(Coagulation test, Robert's test and Heller's test)
 - 5.3 Detection of acetone (nitroprusside test)
 - 5.4 Detection of bile pigments (Gmelin's test and Huppert's test)
 - 5.5 Detection of blood (guaiac test and benzidine test)
6. Vitamin C in fruits
7. Vitamin A and carotens
8. Vitamin B

Ch 433 ORGANIC CHEMISTRY III

1. Principle and application of organic spectroscopy
 - 1.1 Ultraviolet and visible spectra
 - 1.2 Infrared and Raman spectra
 - 1.3 Nuclear magnetic resonance spectra
 - 1.4 Mass spectra
 - 1.5 Structure elucidation by joint application of UV, IR, NMR and mass spectroscopy
2. Illustration of organic chemical principle through the synthesis of some important and biological active natural products
 - 2.1 Vitamin A
 - 2.2 Estrone
 - 2.3 Progesterone
3. Practical course: some advanced techniques in modern organic chemistry
 - 3.1 Extraction of caffeine from tea
 - 3.2 Extraction of chlorophyll from leaves
 - 3.3 Synthesis of suitable substances

Ch 461 FOOD CHEMISTRY

Ch 462 APPLIED CHEMISTRY I

Ch 463 APPLIED CHEMISTRY II

Ch 471 CHEMISTRY FOR SCIENCE TEACHER

Working Schedule
for
Japanese Specialist in Chemistry
in
Four Teacher Colleges in the West

WORKING SCHEDULE
FOR
JAPANESE SPECIALIST IN CHEMISTRY
IN
FOUR TEACHER COLLEGES IN THE WEST
5th FEBRUARY - 31st JULY 1979

Week I (Mon. 5th - Sat. 10th Feb. 1979)

1. Study of chemistry curriculum for Higher Cert. of Educ. level: General Chemistry I & II.
2. Preparation of laboratory guideline for General Chemistry I & II.
3. General Study of Petchburi Teachers College: Chemistry Laboratory room and the library.
4. Petchburi tour: Art and some ancient places (Saturday)
5. Meeting with science teacher of Petchburi Teachers College.

Week II (Mon. 12th - Sat. 17th Feb. 1979)

1. Study of General Chemistry I & II (cont.)
2. Preparation of laboratory guideline for General Chemistry I & II. (cont.)
3. Study of chemistry curriculum for Higher Cert. of Educ. level: Chemistry of Life
4. Preparation of laboratory guideline for Chemistry of Life. High certificate L.
5. General study of Petchburi Teachers College and teaching problem of student-teaching.
6. Cha-Am and Hua-Hin tour.

Week III (Mon. 19th - Sat. 24th Feb. 1979)

1. Study of chemistry curriculum for Bachelor's Degree level: Inorganic Chemistry I.
2. Preparation of laboratory guideline for Inorganic Chemistry I.
3. General study of Jombung Teachers College and problem of science teaching.

Week IV (Mon. 26th Feb. - Sat. 3rd March 1979)

1. Study of Inorganic Chemistry I (cont.)

2. Preparation of laboratory guideline for Inorganic Chemistry I. (cont.)
3. General study of secondary school in Petchburi.

Week V (Mon. 5th - Sat. 10th March 1979)

1. Study of chemistry curriculum for Bachelor's Degree level: Organic Chemistry I.
2. Preparation of laboratory guideline for Organic Chemistry I.
3. Suggestion of problems and procedures for research, according to Sc.351: Research in Science.
4. General study of Nakornpathom Teachers College and problem of science teaching.

Week VI (Mon. 12th - Sat. 17th March 1979)

1. Study of Organic Chemistry I. (cont.)
2. Preparation of laboratory guideline for Organic Chemistry I. (cont.)
3. General study of Kanchanaburi Teachers College and problem of science teaching.

Week VII (Mon. 19th - Sat. 24th March 1979)

1. Study of chemistry curriculum for Bachelor's Degree level: Physical Chemistry I.
2. Preparation of laboratory guideline for Physical Chemistry I.
3. Study of problems of science teaching in secondary school in Petchburi.

Week VIII (Mon. 26th - Sat. 31st March 1979)

1. Study of Physical Chemistry I. (cont.)
2. Preparation of laboratory guideline for Physical Chemistry I. (cont.)
3. Tour of pineapple factory and Kangkrachan dam.

Week IX-XIV (Mon. 2nd April - 12th May 1979)

Preparation of equipment/instruments and chemicals for chemistry laboratory.

Week XV (Mon. 14th - Sat. 19th May 1979)

Workshop of chemistry laboratory for Higher Cert. of Educ. level.
 Participants: Chemistry teachers from 4 teachers colleges. Colleges: P.T.C., J.T.C., N.T.C., K.T.C. (1 ~ 2 for each college)

Week XVI-XVII (Mon. 21st May - Sat. 9th June 1979)

Workshop of chemistry laboratory for Bachelor's degree level.

Week XVIII-XX (Mon. 11th - Sat. 30th June 1979)

1. Workshop of production, direction and maintenance of equipment/instruments.
2. Preparation of handbook for production, direction and maintenance of equipment/instruments.

Week XXI-XXIV

1. Preparation of textbooks for chemistry (particularly) of both levels.
2. Lecture and discussion on some points in chemistry contents of both levels.
3. Educational tour in neighboring provinces.

參考資料 4

An Introduction to the Department
of
Teacher Education

Contents

- I. Structure of Ministry of Education
- II. Department of Teacher Education
 - Historical Development of Teacher Education in Thailand
 - National Policy on Teacher Education
 - Work Plan Implementation of the Department of Teacher Education
 - Structure of the Department of Teacher Education
- III. Curricula
 - Teacher Education Curriculum
 - Curriculum Reform and Teaching Qualifications
- IV. Some Projects
- V. Teachers College Act

Tables

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| Table 2 | Teaching Staff of Each College from 1977 to 1978 |
| Table 3 | Projection of Enrollment based on the Fourth Educational Development Plan (1977 - 1981) |
| Table 4 | The Major Subjects offer in Each Teachers College 1978 |

I. Structure of the Ministry of Education

The Ministry of Education consists of four offices, one institution and seven departments, namely

- | | |
|---------|--|
| Offices | 1. The Office of the Secretary to the Minister. |
| | 2. The Office of the Under-Secretary of State for Education. |
| | 3. The Office of the Private Education Commission. |
| | 4. The Department of General Education. |
| | 5. The Department of Vocational Education. |
| | 6. The Department of Physical Education. |
| Depts. | 7. The Department of Teacher Education. |
| | 8. The Department of Educational Techniques. |
| | 9. The Department of Religions Affairs. |
| | 10. The Department of Fine Arts. |
| | 11. Institute of Technology and Vocational Education. |

The Department is headed by the Director-General, Mr. Charoon Milindra, who is assisted by two deputies, Mr. Panom Kawkamnerd and Mr. Pote Dhanyakhan. Some of the duties and responsibilities are delegated to the two deputies as deemed appropriate by the Director-General.

Office of the Departmental Secretary This division is responsible for the following:

1. For the convenience of administrative purpose, all correspondence from outside the Department is channeled through and processed by the Office of the Departmental Secretary.
2. Public relations in general.
3. To prepare meetings.
4. Any other assignments that are not the responsibilities of other divisions.

Planning Division This division is responsible for the following:

1. To provide consulting services in formulating policies and goals of the Department's projects, and conduct evaluation in accordance with the aims and objectives of the Department and the Ministry of Education.

2. To prepare the annual budget of the Department, including that of the teachers colleges.
3. To collect statistics involving the work of the Department, and to conduct studies relevant to the aims and activities of the Department.
4. To develop and prepare building design appropriate to the needs and requirements of local conditions.
5. To provide liaison service and facilities to foreign personnel and governments having special arrangements with the Thai Government via the Department of Teacher Education.
6. To help selections of personnel for scholarships awarded by international agencies or other sources.

Personnel and Administrative Division This division is responsible for the following:

1. To recruit and allocate teaching personnel for the teachers' colleges under the control of the Department.
2. To process requests for transfer, retirement, and disciplinary actions.
3. To organize grade-promotion examinations held on a yearly basis for officials serving the Department.
4. To keep official cumulative for personnel work.

Financial Division This division is responsible for the following:

1. To authorize payments by the Department, and teachers colleges from budgetary and other sources concerned.
2. To procure equipment and furniture for the Department's central office including provision of proper maintenance.
3. To draft and examine legal contracts involving construction and procurement of equipment and supplies.
4. To provide welfare services and assistance to personnel of the Department.
5. To effect internal auditing of the Department's accounts and to provide services for the Government Auditing Bureau.

In-service Teacher Education Division This division is responsible for the following:

1. To manage in-service teacher education programmes for teachers who wish to upgrade their academic and professional status. These programmes include.

1.1 Direct teaching programme for in-service teachers.

1.2 Organization of examinations for teachers who have terminated courses and teachers who have done study on their own.

1.3 Issuance of the certificates in education for two levels of achievement, i.e.

- the Certificate in Education for 2 year study

- the Certificate for Secondary School Teachers

2. To perform as a central registrar for all teachers colleges.

Teacher Education Division This division is responsible for the following:

1. To procure and develop sites for teachers colleges.

2. To prepare plans for enlarging or merging teachers colleges.

3. To procure equipment and furniture for teachers colleges.

4. To organize entrance examinations, analyse examination questions, and make follow-up studies of the graduates.

5. To administer scholarships and grants for teachers colleges.

6. To promote joint recreational and cultural activities for students from various teachers colleges.

Supervisory Unit The unit is responsible for the following:

1. To develop curricula consistent with the aims of the Department of Teacher Education, and the National Scheme of Education.

2. To organize seminars and conferences for the purpose of promoting cooperation and professional competency among teaching personnel of teacher education.

4. To carry out research work related to teacher education.

5. To develop educational innovation and technology in the field of teacher education.

6. To maintain and develop the necessary standards as regards teacher education.

II. Historical Development of Teacher Education in Thailand

The history of modern teacher education in Thailand is dated back to 1892 in the reign of King Chulalongkorn. Like many development ventures at that time, the first teacher education programme was run by an English man, Mr. C.M. Greenrod as headmaster. The record showed that he began with only three students enrolled in a two-year course.

The first formal school offering the graduate of grade 10 a three year course which led to an elementary certificate of teacher education was founded in 1896. Seven years later, a similar school offering an additional two-year course to the holders of the elementary certificate of teacher education was established. In the same year, another school for elementary teacher education was set up for rural students.

Unfortunately, all the students enrolled in these programmes were male. It was not until 1913 when the first elementary teacher education school for female students was organized. Some twenty-four years later three more of such school were added to the list.

In 1915, the secondary teacher education school was amalgamated with Chulalongkorn Civil Service College which was to become known later as Chulalongkorn University.

In 1941, a coeducational teacher education school was initiated.

In 1947, a teacher education school for home economics and kindergarten was open.

Early 1950's saw a marked development of teacher education in Thailand. With the support from UNESCO and the United States Government, the Ministry of Education was able to develop the staff needed for the implementation of teacher education programme on a nation-wide basis.

In 1954, the Department of Teacher Education was created in the Ministry of Education. The elevation from the status of a division in what was the Department of Primary Education to that of a department was to respond to the need and demand for qualified teachers, and also to set the stage for a major reorganization of the teacher education system. The work began with expansion of the teachers colleges already in existence as well as the establishment of new ones. Some small

teachers colleges were either closed down or merged with others. The college of education, which is a degree granting institution, was also set up to prepare teachers for the upper secondary schools.

As a result of another reorganization of the Department of Teacher Education in early 1973, the College of Education with its branches (eight in number) were grouped to form what was equivalent to a department within the Ministry of Education. In 1975, all Colleges of Education became a university under the control of the Bureau of State University.

There are altogether 45 institutes engaged in preparing teachers to meet the need and demand of the whole country. Of this number, 36 are teachers colleges under direct administrative control of the Ministry of Education, and the remaining faculties of education of various universities under the Office of University Affairs - an authority having the status of a ministry. Teachers colleges with the exception of 6 are situated in the rural areas. The mapping is such that there is at least one teachers college for every two neighbouring provinces.¹ On the university side, 5 of the 9 universities offering a programme in teacher education are located in the provinces outside Bangkok.

The total number of teaching staff in all 45 institutes in 1977 is 6,648² of which 4,790 are employed by the Department of Teacher Training of the Ministry of Education and 1,858 by the Office of University Affairs. About two-third of these teaching staff have qualifications not higher than a bachelor's degree.

The number of the graduates from all teachers education institutes in 1977 is about 67,000. These figures are broken down according to programme levels as follows: about 37,000 for lower certificate; 20,000, for higher certificate and diploma; 11,000 for bachelor's degree; and 370 for post graduate. Out of this total graduate output, about 57,000 most of whom had qualifications below a bachelor's degree

¹ There are 72 provinces in Thailand.

² All statistics quoted in this section of the report are taken from "Education Statistics for 1977", Department of Teacher Training, Ministry of Education, and also "Statistics on Higher Education for 1977", Office of University Affairs, (unpublished).

had gone through the teachers colleges of the Ministry of Education, while about 10,000 with a bachelor's degree or higher were produced by the universities. Added to these figures, about 6,000 "unqualified teachers" who had successfully participated in an in-service teacher education programme were awarded either a higher certificate or a teaching diploma by the Division of In-service Teacher Education of the Department of Teacher Education.

In terms of the numbers of enrolments and graduates, the geographical areas served, the scope and diversity of activities, the Department of Teacher Training is effectively the key authority of teacher education in Thailand.

National policy on Teacher Education

The National scheme of Education 1977, an official document on the broad policy of national education, has been drawn up to bind every government in power to follow the same long term policy on educational development. In respect of teacher education, this document stipulates that "The state shall be responsible for the provision of teacher education for all levels and shall be charged with the preparation of teachers to meet the need and demand for teachers of all educational institutes in such a way the objectives of the National Scheme of Education are fully realized". Also "The provision of teacher education shall be in the form of higher education. However if necessary, teacher education institutes may provide teacher education in the form lower than higher education to fulfil the needs of local conditions."

The Fourth National Plan of Social and Economic Development maps out the specific policy on teacher education into five points, viz.

1. There shall be effective coordination in all teacher education activities and among all educators from all types and levels of education to facilitate the preparation of teachers and teacher educators for the development of national education at all levels.

2. Teacher education shall be developed and expanded in such a way that teachers will be trained to play a wider role in the rural areas.

3. Every teacher education institute engaged in the preparation of teachers shall be a centre for in-service teacher education to up-

grade and update in-service teachers as an alternative to the twilight programme which must be curtailed and eventually replaced.

4. Curriculum development of teacher education shall be relevant to real situations and local needs and at the same time correspond to the curricular of primary and secondary schools.

5. Staff development to increase knowledges and efficiency of the teaching staff for teacher education shall be carried out.

Work Plan Implementation of the Department of Teacher Education

Generally speaking, universities faculties of education involved in preparing teachers are based on the model of western universities. The teachers colleges in contrast to the former, have been developed within the context of educational development under local conditions. Under the direct administrative control of the Ministry of Education, the teachers colleges have been able to adapt themselves to the various needs created by the introduction of changes in the education system, such as new curriculum and increasing enrolments in primary and secondary school etc.

The Department of Teacher Education in effort to implement its plan based on the National Scheme of Education and the Fourth National Economic and Social Development Plan puts emphasis on five working area:

1. Pre-service Teacher Education
2. In-service Teacher Education
3. Provision of Technical Services to Community
4. Research and Development
5. Promotion and Preservation of National Identity, Art and Culture in the Thai Context.

First Area - Preparation of teachers

The 36 teachers colleges are charged with the direct responsibility to prepare teachers for nursery, primary and secondary schools. Under the current system, there are three levels of teacher education. The table below gives the prerequisites of the student input to each training level, the qualification awarded and the expected performance of the graduate output.

Level	Qualification of the student input	Qualification awarded	Expected performance of graduate output
1. 2 yrs. course	Graduates of lower secondary school	Lower Certificate	Teaching in primary classes
2. 2 yrs. course	Graduates of higher secondary school or lower certificate programme	Higher Certificate	Teaching in lower secondary classes
3. 2 yrs. course	Graduates of higher certificate programme	B.D.	Teaching in higher secondary classes

It has been projected that the lower certificate programme will have been terminated before the end of 1982, while the higher certificate and degree programmes will continue to be the main activities of all teachers colleges. The four-year period in the fourth National Economic and Social Development Plan has seen all teachers colleges concentrating their effort and attention on the quality of their graduates and the number of students input more closely related to job demand.

Second Area - In-service Teachers Education

The result of a survey conducted in 1975 shows that there were about 80,000 unqualified teachers engaged in active teaching service. As the government has no plan to terminate the employment of these unqualified teachers, the Department of Teachers Education through the Division of In-service Teacher Education is committed to a long-term project to provide in-service teacher education to unqualified teachers. Under the scheme of this project, an unqualified teacher may do a study on his own or attend an in-service training course offered during a school vacation. In either case, he is expected to take a series of examinations which would earn him a certificate in education or a teaching diploma. The following table gives the numbers of teachers who received in-service training and passed examination on the subject which individual trainees applied in 1976 and 1977. The number of successful candidates does not correspond to the number of teachers who become qualified teachers, since each trainee is expected to pass examination in several subjects before he is awarded a certificate in education or a teaching diploma.

Years	Number of Trainees	Number of successful candidates
1976	53,451	38,591
1977	45,735	31,709

Third Area - Provision of Technical Service to Community

The Department of Promoting Technical Service for Development of the Ministry of Interior and the Division of Non-Formal Education in the Department of General Education of the Ministry of Education are two main organizations which provide vocational and non-formal education to the adults in the rural areas. In spite of the extensiveness of their programmes, there is still room for participation by other organizations both private and governmental. Almost every provincial university and college have run projects which provide services and education to its local populace. Among 36 teachers colleges, 25 have already launched about 90 such projects. Some of these projects are for examples.

- Project to combat against diseases
- Project to improve the quality of drinking water
- Project to fight against drug abuse
- Project to prevent environmental pollution
- Project to promote fresh-water fishery
- Project to encourage cultivating forests
- etc.

Fourth Area - Research and Development

At the rate of modern concepts of education planning being accepted and translated into practice, the need for active research has become more and more obvious. Thirty teachers colleges are now engaged in educational research the topics of which are diversified in nature and cover various aspects of teaching and learning. Almost without exception, these research activities are operated on a small budget and receive no financial support from outside sources. In most cases research results are published in the form of a pamphlet and presented for discussion at meetings and seminars organized by teachers colleges. The Division of Planning in the Department of Teacher Educa-

tion maintains a team to carry out basic research in order to obtain data for the planning of teacher education.

Fifth Area - Promotion and Preservation of Art and Culture

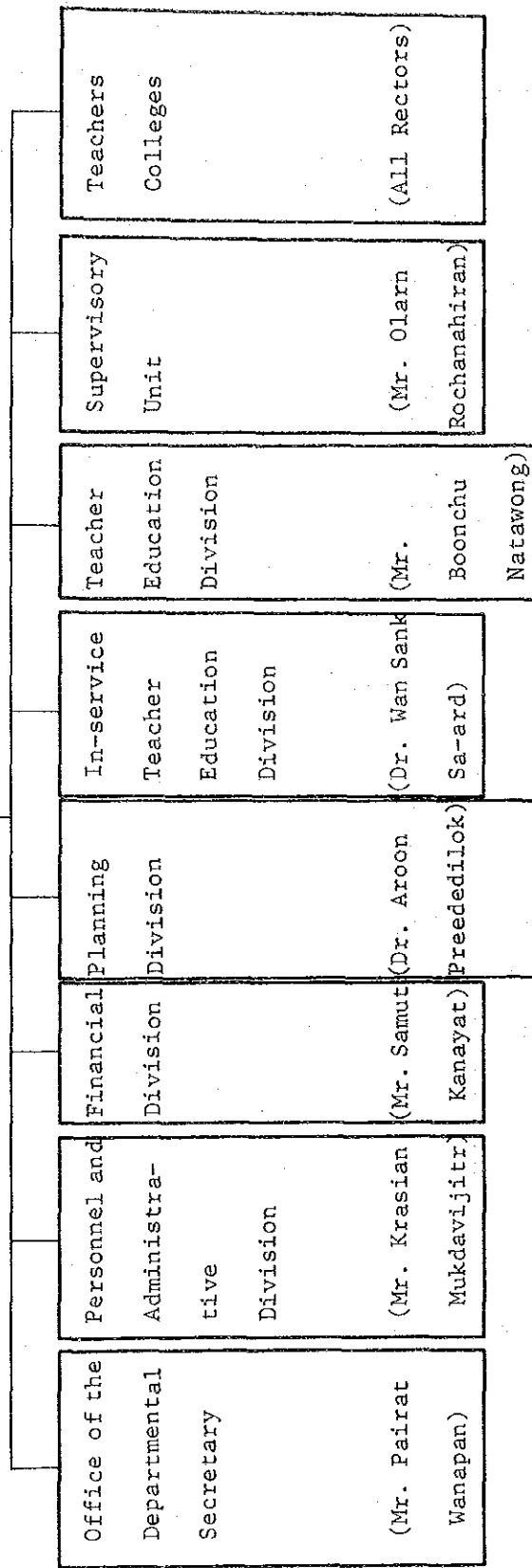
Generally speaking, the promotion and preservation of art and culture come under the direct responsibility of the Department of Religious Affairs and The Department of Fine Arts both of which are under the Ministry of Education. Due to paucity of resources and personnel combined with vast needs to be fulfilled, participation and contribution by both private and other governmental units are welcome by the Ministry of Education. The concept of the teachers college as an institute for supporting cultural activities and arts is clearly spelled out by Teachers College Act 1975.

The activities to promote art and culture organized by teachers colleges have found expression in several forms such as exhibition, Sunday school, drama, project, local literature and folklore.

Director-General
(Mr. Charoon Milindra)

Deputy Director-General
(Mr. Panom Kawkamnerd)

Deputy Director-General
(Mr. Pote Dhanyakhan)



The scheme of the structure and the names of each section of the
Ministry of Education

Table 1. The Enrollment of Each Teachers College from 1977 to 1979

No.	Teachers College	1977	1978	1979
1	Chantarakasem	2,072	2,590	1,544
2	Bansomdet	2,233	1,528	1,425
3	Suansunanta	1,332	1,134	1,576
4	Suandusit	1,778	1,417	1,415
5	Pranakorn	1,805	1,411	1,528
6	Thonburi	833	753	880
7	Nakornpathom	1,692	1,408	1,168
8	Yala	1,821	1,797	1,527
9	Songkla	2,225	2,165	1,941
10	Nakornsitammarat	2,128	2,181	1,835
11	Surattnani	629	729	827
12	Puket	1,279	1,132	1,190
13	Mooban Chombueng, Rajburi	1,436	1,270	1,139
14	Kanchanaburi	870	946	960
15	Petchburi	1,408	1,001	907
16	Tepsatri, Lopburi	2,068	1,738	1,480
17	Ayuttaya	1,801	1,670	1,856
18	Petchaburiwittayalongkorn	1,527	1,428	1,515
19	Piboonsongkram, Pitsanulok	2,228	2,174	2,063
20	Petchboon	867	883	900
21	Kampaengpet	584	694	1,001
22	Nakornsawan	2,607	2,331	1,767
23	Uttaradit	1,721	1,613	1,540
24	Chiengmai	2,377	2,194	2,114
25	Chiengrai	1,336	1,409	1,326

No.	Teachers College	1977	1978	1979
26	Lampang	1,790	1,478	1,458
27	Udonrtani	2,840	2,676	2,353
28	Sakonnakorn	2,220	2,118	1,840
29	Loey	1,207	1,264	1,203
30	Ubonrajatani	2,628	2,604	2,243
31	Mahasarakarm	2,609	2,707	2,570
32	Nakornrajasima	3,211	3,080	2,466
33	Burirum	2,870	2,503	2,264
34	Surin	1,639	1,757	1,820
35	Chacherngsao	1,651	1,442	1,098
36	Chantaburi	1,058	1,192	1,097
	Total	64,390	59,423	55,836

Table 2 Teaching Staff of Each Teachers College from 1977 to 1978

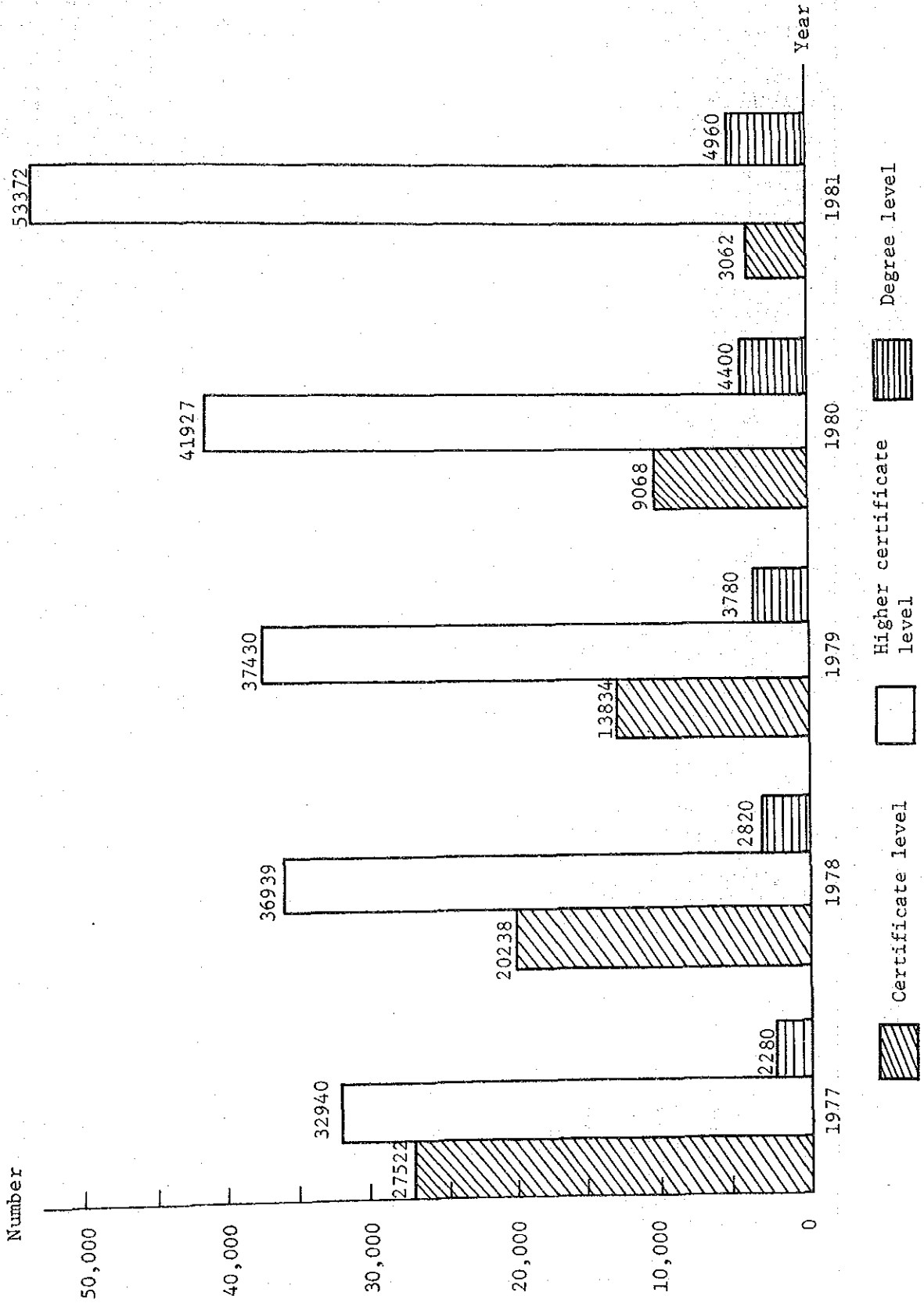
No.	Teachers College	Year	
		1977	1978
1	Chantarakasem	184	251
2	Bansomdet	229	284
3	Suansunanta	231	269
4	Suandusit	229	276
5	Pranakorn	174	222
6	Thonburi	98	146
7	Nakornpathom	169	200
8	Yala	119	142
9	Songkla	164	215
10	Nakornsitammarat	129	157
11	Suratthani	45	74
12	Puket	97	153
13	Mooban Chombueng, Rajburi	108	145
14	Kanchanaburi	61	90
15	Petchburi	160	184
16	Tepsatri, Lopburi	156	179
17	Ayuttaya	150	199
18	Petchaburiwittayalongkorn	162	190
19	Piboonsongkram, Pitsanulok	156	238
20	Petchboon	52	72
21	Kampaengpet	52	63
22	Nakornsawan	158	186
23	Uttaradit	138	157
24	Chiengmai	193	231

No.	Teachers College	Year	
		1977	1978
25	Chiengrai	79	102
26	Lampang	105	132
27	Udonrtani	137	160
28	Sakonnakorn	113	133
29	Loey	54	77
30	Ubonrajatani	138	169
31	Mahasarakarm	147	190
32	Nakornrajasima	165	197
33	Burirum	144	176
34	Surin	75	104
35	Chacherngsao	126	152
36	Chantaburi	93	111
	Total	4,790	6,026

Table 3 Projection of Enrollment based on the Fourth Educational Development Plan (1977 - 1981)

Academic year		1976	1977	1978	1979	1980	1981
Level	Grade						
Certificate	1st year	15,112	12,410	7,670	6,006	3,062	-
	2nd year	24,128	15,112	15,196	7,828	6,006	3,062
	Total	39,240	27,522	22,866	13,834	9,068	3,062
Higher Certificate	1st year	14,519	18,421	17,836	18,912	23,015	30,357
	2nd year	11,641	14,519	14,421	18,518	18,912	23,015
	Total	26,160	32,940	32,257	37,430	41,927	53,372
Bachelor's Degree	1st year	1,050	1,230	2,917	2,190	2,210	2,750
	2nd year	856	1,050	1,383	1,590	2,190	2,210
	Total	2,000	2,280	4,300	3,780	4,400	4,960
Total		67,400	62,742	59,423	55,044	55,395	61,394

Projection of Enrollment based on the Fourth Educational Development Plan



I. student who graduates

The Major Subjects Offered in Each Teachers College 1978

No.	Major Subject	Special Ed.	Early Childhood Ed.	Music Ed.	Drama	Library Science	History	Thai	English	Geography	Art Ed.	Social Studies	General Science	Chemistry	Biology	Physics	Agriculture	Math.	Home Economics	Physical Ed.	Health Ed.	Industrial Art.	Arts and Craft	Metal Work	Auto Mechanical	Electricity & Electronics	Ceramics	Construction Work	Drawing & Design
1	Chantarakasem			*		*		*	*			*	⊗				⊗	*		*									
2	Bansomdet			⊗		*	○	⊗	⊗	○	*	⊗	*					*	*	*	*								
3	Suansunanta				⊗	*		⊗	⊗		*	*	⊗					*	*										
4	Suandusit	*	*					*	*		*	⊗	⊗					*	⊗										
5	Pranakorn					*		⊗	⊗		*	*	⊗					*					○	○	○	○	○	○	○
6	Thonburi					*		*	*			*	⊗					*											
7	Nakornpathom		*			*		*	*		*	⊗	⊗					⊗	*	*	○	*							
8	Yala		*					*	⊗		*	*	⊗					*	*	*	⊗	*							
9	Songkla		*	*		*		⊗	⊗		*	⊗	⊗					⊗	*	*	*	*	*	*	*	*	*	*	*
10	Nakornsitamarat					*	*	⊗	*	*	*	⊗	*					⊗	*	*	*	*	*	*	*	*	*	*	*
11	Suratthani							*	*			*	*									*	*	*	*	*	*	*	*
12	Puket							*	*			*	*					⊗	*	*	*	*	*	*	*	*	*	*	*
13	Mooban Chombueng, Rajburi							⊗	*			*	*					*	*	*	*	*	*	*	*	*	*	*	*
14	Kanchanaburi		*					*	*			*	*					*	*	*	*	*	*	*	*	*	*	*	*
15	Petchburi					*		⊗	*			*	⊗					⊗	*	*	*	*	*	*	*	*	*	*	*
16	Tepsatri, Lopburi		*			*		*	*	○		*	⊗					*	*	*	*	*	*	*	*	*	*	*	*
17	Ayuttaya		*			*		⊗	*		*	⊗	⊗					*	*	*	*	*	*	*	*	*	*	*	*
18	Petchaburiwittayalongkorn		*					*	*			⊗	⊗					*	*	*	*	*	*	*	*	*	*	*	*
19	Piboonsongkram, Pitsanuloke		*			*		⊗	*		*	*	*					*	*	*	*	*	*	*	*	*	*	*	*
20	Petchboon							*	*		*	*	*					*	*	*	*	*	*	*	*	*	*	*	*

The Major Subjects Offered in Each Teachers College 1978

No.	Major Subjects		Special Ed.	Early Child-	Music Ed.	Drama	Library Science	History	Thai	English	Geography	Art Ed.	Social Studies	General Science	Chemistry	Biology	Physics	Agriculture	Math.	Home Economics	Physical Ed.	Health Ed.	Industrial Art.	Arts and Craft	Metal Work	Auto Mechanical	Electricity & Electronics	Ceramics	Construction Work	Drawing & Design
	Teachers Colleges			hood Ed.																										
21	Kampaengpet								*	*			*	*	*				*	*	*	*	*	*						
22	Nakornsawan				*				⊙	⊙			⊙						*	*	*	*	*							
23	Uttaradit						*		*	⊙		*	*	*				*	*	*	*	*	*							
24	Chiengmai				*				⊙	⊙		*	*	*	⊙			⊙	*	*	*	*	*							
25	Chiengrai								*	*		*	*	*				*	*	*	*	*	*							
26	Lampang								*	*		*	*	*				⊙	*	*	*	*	*							
27	Udonrtani				*				⊙	⊙		*	*	*				*	*	*	*	*	*							
28	Sakonnakorn						*		⊙	⊙		*	*	*				*	*	*	*	*	*							
29	Loey					*			*	*		*	*	*				*	*	*	*	*	*							
30	Ubonrajatani						*		⊙	⊙		⊙	*	*				⊙	*	*	*	*	*							
31	Mahasarakarm			*					⊙	⊙		*	*	*				⊙	*	*	*	*	*							
32	Nakornrajasima						*		⊙	⊙		*	*	*				⊙	*	*	*	*	*							
33	Burirum								⊙	⊙		⊙	*	*				*	*	*	*	*	*							
34	Surin				*				⊙	⊙		*	*	*				*	*	*	*	*	*							
35	Chachengsao			*					⊙	⊙		*	*	*				*	*	*	*	*	*							
36	Chantaburi								*	*		*	*	*				*	*	*	*	*	*							

○ = Degree Level

* = Higher Certificate of Education Level

III Curricula

Teacher Education Curriculum

I. Principle and Rationale

In 1974, the teachers colleges under the responsibility of the Department of Teacher Education offered a new programme leading to a Bachelor's degree in Education. Previously these Colleges had offered only a Certificate of Education and a Higher Certificate of Education. As a temporary measure the Colleges borrowed the B.Ed. curriculum of SriNakarin Wiroj University but the Department of Teacher Education appointed a Committee to plan a new B.Ed. curriculum for the exclusive use of the teachers. The three main areas of this curriculum comprise general education, professional training, and specialised programmes which are expected to have a positive effect on education in general, as well as the economy and the social structure of the nation. This curriculum, however, has to follow the academic requirements laid down by the Bureau of State Universities.

The new Teacher Education Curriculum was aimed at producing teachers who have knowledge, ability, skill, and attitudes which lead to a better understanding of their own role and duty in the environment and society. Such teachers will also have the ability to apply a knowledge and understanding of the teacher's role to improve education for life and society. This must be compatible with the situations and constraints of the nation.

II. Guidelines for Curriculum Planning

In developing the teacher education curriculum, the first consideration was a study of the following economic and social trends which effect teacher training:

- Social and economic conditions in rural and urban areas.
- Living and earning by means of agriculture and industry
- The national socio-economic plan
- Government and political institutions
- Cultural and religious institutions
- Changes in science, technology, and population patterns
- Changes occasioned by outside impacts, and affecting thoughts, values, philosophy and culture

- Educational theory and policy, related to educational problems (original "Ideology")
- Educational research in general, but with special reference to teacher education.

These guidelines used in the planning stage of the teacher education curriculum are intended to serve the real needs of Thai society.

Objectives

The teacher education curriculum of the Teacher Education Council aims at the following objectives to serve the needs of Thai society.

- 1) To encourage student teachers to improve their knowledge, ability and responsibility for a future career in the teaching profession.
- 2) To be conscientious, and to serve as an example of attitudes which are accepted by society.
- 3) To maintain good personal habits, to be honest and industrious, and to adopt standards appropriate to the teaching profession.
- 4) To be keen to search for knowledge, to be creative, and to be aware of social problems; and to develop skills which might be the useful in solving those problems.
- 5) To improve both physical and mental health for the benefit of both the individual and the community as a whole.
- 6) To establish good working habits, with the correct degree of respect for others, and lack of selfishness.
- 7) To develop loyalty and confidence in the Nation, Religion, and the King for the benefit of national security.
- 8) To develop further the democratic way of life through attitudes and understanding of the country and government.
- 9) To understand fully the national identity and culture of the Thai people, while at the same time developing an awareness of the culture of others.
- 10) To develop an attitude in which material progress is achieved with the proper use of scientific and technological aid, but at the same time preserving the natural environment.
- 11) To promote skills and attitudes, together with the necessary knowledge, for a programme of local, social, and economic development throughout the country.

Structure of the Curriculum

- 1) The curriculum is designed to train teachers for two educational areas as follows:
 - a) an integrated primary and secondary education programme
 - b) early-childhood education
- 2) The curriculum covers two levels of attainment:
 - a) The Higher Certificate of Education, for which the minimum requirement is 70 credits and a minimum study period of 4 semesters.
 - b) The Bachelor's Degree in Education, for which the minimum requirement is 65 credits and a minimum study period of 4 semesters.
- 3) The curriculum is divided into three broad areas of study, as follows:
 - a) General Education: consisting of division of languages, humanities, science, social sciences and practical education.
 - b) Professional Training: consisting of all education courses, including theory, principles, techniques, methods, and strategies, as well as actual teaching practice aimed at improving the efficiency of the teaching profession.
 - c) Specialised Program: this is designed for trainee teachers who wish to prepare for some branches of special education, and will consist of subject areas, content materials, and details from other areas which are applicable to the specialisation.

Certain courses from each of these groups will be open to all students as elective courses.

- 4) The following 18 subjects will be offered for both major and minor study:

Thai	Agriculture
English	Home Economics
Geography	Physical Education
History	Health Education
Physics	Music

Curriculum Reform and Teaching Qualifications

Rationale

The teacher education curriculum for both the Higher Certificate of Education and the Bachelor's Degree programme has been extensively revised by the Teacher Education Council since 1974. Among other changes it was necessary to revise the programme for the Certificate of Education for its assimilation into the teacher education system as a whole. The reforming process has also involved a change to semester system as used in the Bachelor's Degree programme, while changes in both content and structure were necessitated for the requirements of the higher secondary programme (M.S. 4-5).

Some changes were made in the total number of credits, and in subject content. At the same time teacher education students were allowed to select certain subjects according to their aptitude. In general, however, the overall structure of the programme remained unchanged except for the number of credits allotted for English Courses.

Structure

All courses were classified in three major categories: General Educations, Specialised Subject and Professional Training for Teachers.

General Education courses were those offered in the Liberal Arts Programme, and emphasised content and general knowledge necessary to the students' future life, as well as their teaching career and the process of learning.

Specialised Subjects are defined as courses which provide training for future use in specific areas. Students are encouraged to select courses in accordance with their aptitude and interest. Such courses would also be necessary for those who would be teaching in the elementary schools. (At the present time teachers able to teach these subjects adequately are very much in demand.)

Professional Training covers both theory and practice in teaching, and covers methodology and teaching-learning process. These are required courses for all teachers.

Preparation

The minimum number of credits required in programme is 87, comprising 49 for General Education, 24 for Specialised Subject and 14

for Professional Training. Of the 24 credits for Specialised Subject 16 are gained through required courses and the remaining 8 from elective courses.

Level	General Education	Specialised Subject		Professional	
Certificate	49	16	8	14	87

Objectives

The objectives of this programme are that, with two years of training beyond secondary level (M.S.3) those who successfully complete the course will be able to teach in elementary schools, and should possess the following qualities:-

- 1) Be well educated in all three areas of the programme, and able to apply their knowledge to both teaching and living.
- 2) Be creative, and have an interest in acquiring new knowledge.
- 3) Be aware of their own interests and aptitudes.
- 4) Be able to understand children and young people, and be able to teach and supervise them.
- 5) Be able to use locally available resources to make a worthwhile contribution to both the school and the community.
- 6) Be able to appreciate the importance of their task, and to undertake it in a responsible manner.
- 7) Respect national values, morality and culture.

The Preparation of Teachers for the Automatic
Promotion Program and Functional Literacy Program

Background of the NTS R Research Project

In August 1972, SEAMEO¹ recognized the importance of teacher education as being an essential educational process to be seriously promoted for the coming decade. As a result of this recognition, INNOTECH², therefore, organized three meetings in Manila, the Philippines, for the purpose of brainstorming about teacher education.

The first meeting, held on August 23 - 27, 1976, was a seminar on New Roles of Teachers in Innovative Educational Programs and Delivery Systems. It was proposed that INNOTECH concentrate its focus of attention on Nontraditional Roles of Teachers (NTR), trying to find out through research what these roles should be.

The second meeting, held on February 9 - 11, 1977, was to determine main principles of teacher education in the five member countries, i.e. Indonesia, Malaysia, the Philippines, Singapore and Thailand. From this meeting INNOTECH approved in principle to carry out researches on the new roles of teachers. It was also expected that the researches might possibly be funded by IDRC.

The third meeting, held on June 6 - 18, 1978, was attended by the delegations of the five member countries to plan the research activity. Outlines of the researches and their plans were prepared for submission to IDRC to apply for financial support.

In the third meeting, each country delegation was requested to bring to the workshop descriptions of six innovative educational programs, from which two would be chosen for research in preparation for teachers.

As for Thailand, which has participated in this project since the very beginning, the Ministry of Education, by the Department of Teacher Training, sent a delegation to attend the meeting, prepared and carried out 2 innovative programs for teacher preparation (six programs were presented, two of which were chosen by the meeting), namely:

-
- 1 Southeast Asian Ministry of Education Organization.
 - 2 SEAMEO Regional Centre for Educational Innovation and Technology, presently sited in Manila, the Philippines.

1. Adult Functional Literacy Program
2. Automatic Promotion Program

The first program is concerned with non formal education, while the second is about formal education.

Importance of the Research:

Both of the innovative educational programs, the Adult Functional Literacy Program and the Automatic Promotion Program, are of great importance in connection with basic education. The first program is concerned with non-formal education, while the second is about formal education. Both programs are nationally carried out.

The success of both programs consists in the teacher, who must be able to work in his new roles with better efficiency and in a more effective manner. According to those innovative programs, the teacher's new roles do not occur by chance. Rather, systematic training is needed to enable the teacher to understand and work in accordance with his new roles. The objective of this research is to find out appropriate and effective methods for teacher preparation for both innovative programs mentioned above.

Goal of the Research

This research aims at seeking guidelines for teacher preparation for the Adult Functional Literacy Program and the Automatic Promotion Program, both of which are nationally carried out. This is due to the fact that the teacher plays important roles and is highly influential over the efficiency of education. If the teachers for both programs are competent and well trained, success will be brought about to the students or learners of both programs. The educational goal will thus be attained.

In order to attain the goal, this research project has the following objectives:

1. To study what competencies are required of the teacher of both programs, including the priority of these competencies.
2. To study the strategy, methodology, materials and evaluation methods to be used in the formation of the teacher's competencies found in 1.

3. To construct teacher preparation packages in accordance with the strategy, methodology, materials and evaluation methods found in 2.

4. To select highly effective teacher preparation packages for further use.

5. To find out guidelines for teacher preparation for other innovative programs than the two mentioned above.

Scope of the Research

This program is restricted only to the Adult Functional Literacy Program and the Automatic Promotion Program. The way in which to determine the population and sampling groups is as follows:

As for the Adult Functional Literacy Program, which consists of various types of teaching staff, such as monks, pre-service teachers, in-service teachers, etc., it is determined that only in-service teachers are chosen as population. Among these only those who have passed the criterion are further chosen: those who are able to answer the questionnaire¹. Then 10 to 15% of these teachers are randomly sampled.

As for the Automatic Promotion Program, only those schools that have fully joined the program for six to seven grades are chosen. The total number of these schools is about 100. Ten to fifteen per cent of the teachers in these schools who have passed the criterion are randomly sampled.

In practice, the sampling procedure is as follows:

1. It was started with the random sampling of two provinces from each of the four geographical regions, adding up to provinces.

2. Then two schools in each of the eight provinces were in turn randomly chosen adding up to 16 schools. (In practice, owing to the limitation of traveling and expenses, purposive sampling was used.)

3. Teachers from the 16 schools were selected in accordance with the criterion.

4. At least 10% of the selected teachers were randomly sampled. (For further detail, see Chapter III.)

1.- From the tryout of the research instruments, it was found that some types of teachers were unable to answer the questionnaire. Therefore, criterion setting was needed to select suitable people.

Research Method

This research can be divided into four mini-researches, for each of which different research methods were used as follows:

1. The Study of Teacher Competency Two methods of study were employed.

- 1.1 The documentary study was employed to study only the Adult Functional Literacy Program and the Automatic Promotion Program in order to be the guidelines for the construction of survey forms.
- 1.2 The survey was the carrying out of the study of critical incidents for both programs, using the following 3 techniques.
 - (1) Questionnaire. The teacher was required to report important events.
 - (2) Direct Observation Form. This form was used for important events directly observed.
 - (3) Interview Form. This form was used for interview in case it was found that important events were ambiguous and the observer could not judge whether such events were effective or ineffective.

Both documentary study and survey made it possible to know important behaviors of the teacher in each program. Teacher's behaviors were grouped and frequencies of the behaviors were considered teacher's competencies.

2. The Construction of Teacher Preparation Packages From the study of important events, which made it possible to determine teacher's behaviors, enabled us to determine the following:

- 2.1 The names of teacher competencies
- 2.2 Rationale and importance
- 2.3 Scope
- 2.4 Objectives of training

Then the group of experts in construction of teacher preparation packages would help to determine:

- 2.5 Strategy in training
- 2.6 Methods of training
- 2.7 Learning media

2.8 Measurement and evaluation

Then the group of experts in construction of teacher preparation packages would start their work, together with the mini-tryout.

3. Tryout The whole set of teacher preparation packages was tried out through the use of Two-group Pre-test Post-test Design with Randomized Approach.

4. Follow-up After the tryout of the teacher preparation packages, follow-ups were made to see whether the trainees would show the expected competencies. The methods used were direct observation, interview and questionnaire.

The Centers of Cultural Promotion and Preservation

Responsible Organizer: All teachers colleges throughout the country

Principle and Rationale

Because of the present communication, people all over the world can learn what happens in the foreign countries more quickly. Therefore come the imitations of what they are impressed in those countries. Having seen such imitations in our country, it is afraid that our national culture might be ignored by our own people, and then external influences might replace it. In order to conserve it, the cultural centres should be established particularly in teachers colleges where academic service has been served for the people in community.

Objectives:

1. To preserve and promote the national identity, art and culture in Thai context.
2. To expand them to all people.
3. To cultivate the people especially children in the country to follow the national identity, art and culture as their national cultural estates.
4. To strengthen the people's belief in the three national institutions: Country, Religion and King, since the stability of the country is regarded as the most important single factor in education.

Procedure: The procedure can be expressed in the form of

1. Exhibition
2. Study tour
3. Drama
4. Demonstration
5. Project
6. Literature and folk-love
7. Sunday school
8. the participation of seasonal festivals

Duration: The duration depends upon the activities which can be divided into two categories: seasonal activities and non-seasonal activities.

1. Seasonal activities take place in different seasons.

2. Non-seasonal activities are arranged in any proper time approved by a teachers college.

Expected Outcomes: The national identity, art and culture are better understood and widely accepted by most people of the country as their valuable cultural estates.

Expenses: The expenses are mostly sponsored by the Department of Religions Affairs.

IV Some Projects

Project:

Service Centers to Support the Teaching of Sciences and Technology.

Responsible Organization:

Department of Teacher Education and the Institute for the Promotion of the Teaching of Science and Technology.

Principle and Rationale:

According to the announcement of the Ministry of Education on the implementation of the new curricula of Science and Mathematics prepared by the Institute for the Promotion of the Teaching of Science and Technology, most schools will face the problem of the lack of teaching materials. Recent follow-up on the implementation progress reveals that the problem will continue to persist. For this reason the capacity of the schools to develop and repair their own teaching materials from locally available resource is to be maximized. The Department of Teacher Education with the joint cooperation of the Institute for the Promotion of the Teaching of Science and Technology has launched a project to establish Service Centers at all teachers colleges with the aim of providing technical supports for schools in their zone to become self-sufficient in developing and maintaining teaching materials for the teaching of science and mathematics.

Objectives: The objectives of the service centers are:

1. To provide teachers and pupils of the schools in their areas with facilities to prepare and try teaching materials built from locally available materials and to repair the same.

2. To provide teacher and pupils of the schools in their areas with consultation service pertaining to audio-visual aids and science equipment.

3. To serve as a reference source which maintains all exemplar teaching aids.

4. To serve as a training center for repairing all science equipment.

5. To serve as a data bank for the development of science teaching aids.

6. To serve as a center for in-service and pre-service science education.

Operation The operation of the project is phased as follows:

1. Identify teachers colleges when the centers are to be established on a yearly basis, the projection is such that all 36 teachers colleges shall have a center each within 3 years.

2. Equip the centers with the equipment to produce teaching aids including necessary audio-visual aids.

3. Appoint appropriate personnel to man the center from those who have received training from the institute for the promotion of the Teaching of Science and Technology.

4. Inform all schools.

5. Provide teaching and learning service to the schools in the form of lending equipment, recommendation, repairing, workshop seminar etc.

Project: Villagers College Project

Responsible Organizer: Sakonnakorn Teachers College

Principle and Rationale

Since education is treated as a necessary basis of living, it should be increasingly provided for most people throughout the country. It is believed that the higher education people get; the better living they can earn which can considerably help contribute the economic, social and political development of the country. This project is intended to upgrade the villagers' living by offering them the better chance of education.

Objectives: The objectives of the project are as follows:

1. To provide the villagers for professional and academic training.
2. To provide the villagers for an opportunity of increasing their education.
3. To promote national culture and morality to the villagers.

Procedure:

1. The training is open on weekends only.
2. The training is open for all villagers regardless of sex, age and qualification, and free of charge.
3. The training is arranged in the forms of panel discussion, lecture, experiment, practice, and study tour.
4. The staff consists of teachers of Sakonnakorn Teachers College and local experts on different fields of study.

Subjects Offered: The thirteen subjects offered are:

1. Agriculture
2. Family Planning
3. Thai Culture
4. Thai Government
5. Common Principles for Local People
6. Common Law for Public
7. Present Situation of Thailand
8. Living of Local People
9. Education on Narcotic Drugs

10. Education on a Co-operative
11. Artificial Breeding of oxen
12. Special Activities
13. Home Economics

Site: The training might be arranged at any local place approved by the College.

Duration: Each training takes at least four days.

Expenses: Each training needs 5,000 baht for academic publication which is supported by donation.

Expected Outcome:

It is expected that within five years this project can help upgrade the people's living in all districts of Sakonnakorn province.

Project: Staff Development for Administration of
Higher Education

Rationale

According to the Teachers College Act. B.E. 2518, each teachers college is to be a degree-granting institute in national level with a broader role to play in national development. To keep up with this new task, organization behaviour of the teachers colleges must be adjusted to meet the challenge. In many ways, this change has already take place in all 36 teachers colleges.

However the approaches adopted vary from one teachers college to other, depending on the administrative experiences of individual college staff. In most cases, the methodology is still on a trial and error basis. The Department of Teacher Education which is fully aware of this need has proposed a programme of staff development for administration of higher education.

Objectives

The objectives of the programme are as follows:

1. To provide an opportunity for educational personnel to review post performance and achievements.
2. To help educational personnel improving the efficiency of administration and management.
3. To exchange experiences and problem solving methods among teachers colleges.

Targets

It is projected that 252 educational personnel which have attended trainings, seminars phased for 7 groups of participants as follows:

Phase I

1. Rectors of teachers colleges from seventeen teachers colleges: Suandusit, Yala, Nakornsitamarat, Surattani, Mooban Chombueng, Kanchanaburi, Tepsatri Lopburi, Ayuttaya, Chantaburi, Petchboon, Uttaradit, Chiangmai, Chiengrai, Lampang, Skonnakorn, Loey and, Surin.
2. Seventeen educational personnel from job classification 5 and above from the divisions of the department.

Phase II

Thirty-six deputy rectors from the thirty-six teachers colleges.

Phase III

Thirty-six heads of faculties of education from thirty-six teachers colleges.

Phase IV

Thirty-six deputy rectors for administrative affairs from thirty-six teachers colleges.

Phase V

Thirty-six heads of faculty of science from thirty-six teachers colleges.

Phase VI

Thirty-six deputy rectors for student activities from thirty-six teachers colleges.

Phase VII

Thirty-six heads of faculty of humanity and social science from thirty-six teachers colleges.

Location:

Teachers colleges in Bangkok, NIDA, and some other places.

Duration:

November 1978 - August 1979, two weeks for each phase.

Project: The Establishment of Service Centre for the Teaching of Science and Technology.

Responsible Organization: Department of Teacher Education and the Institute for the Promotion of the Teaching of Science and Technology.

Principle and Rationale: According to the announcement of the Ministry of Education on the new curricula of science and mathematics prepared by the Institute for the Promotion of the Teaching of Science and Technology, considerable needs in the area of teaching aids will continue to persist for most of the schools. Recent following-up of those new curricula indicate that the problem of the lack of necessary teaching aids has affected most schools. For this reason, the capacity of teachers colleges to develop their own teaching materials from locally available resources is to be maximized.

Objectives:

1. To provide teachers and students for the source of making, mending and experimenting the scientific equipment by using available cheap materials.
2. To provide teachers and students for the centre of academic affairs; audio-visual and scientific aids.
3. To be a collection of materials for the teaching of science in school.
4. To be a source for the skill increase of the scientific teaching aid workshop.
5. To be an information source for the development of scientific teaching aids.
6. To be a training centre for both pre-service and in-service teachers.

Procedure:

Step I The establishment of teachers colleges to be the centres for the teaching of science and technology which must be completed within three years.

Step II The provision of productive equipment of scientific and audio-visual aids for the centres.

Step III The prescription of the centre personnel well-trained by the Institute for the Promotion of the Teaching of Science and Technology.

Step IV Informing schools throughout the country of the centre service.

Step V The supply of teaching service to all schools by means of having teaching aids on loan and counseling.

Expected Outcome The schools throughout the country will have

1. a central source for making, repairing and experimenting the scientific teaching aids.
2. a collection of scientific teaching-aids and a central information source for developing scientific teaching aids for schools.
3. a training centre for pre-service and in-service teachers for the teaching of science in schools.

Project: The Training of the In-service Teachers and Educational for the Educational Promotion according to the Curriculum of Teacher Education Council 1976

Responsible Organization All teachers colleges

Principle and Rationale

It is stated in the National Educational Development Plan, Phase 4, 1977 - 1981 that the in-service teachers and educational personnel need to be urgently trained to serve the new role of educational development the current educational statistics indicates that a great number of teachers and educational personnel throughout the country require to be upgraded. As it is mentioned in the National Scheme of Education that Teacher Education shall be managed by the state only. Consequently, the Department of Teacher Education, one responsible agency for this matter, has the duty on providing training courses for those people. The implementation depends upon the readiness of each teachers college.

Objectives:

1. To upgrade the in-service teachers and educational personnel.
2. To update the working ability of those in-service teachers and education personnel.
3. To provide academic service to the community for all rural in-service teachers and rural educational personnel.
4. To upgrade their professional status.
5. To brainstorm all the rural available resources.

Target: The in-service teachers and educational personnel.

Duration: The training must be held on weekends, in summer or on any other days approved by teachers colleges. It must be completed in at least three years or not longer than six years.

Site: All teachers colleges and any rural teacher education centres under the responsibility of teachers colleges.

Curriculum and Evaluation: The curriculum and the evaluation system used are under the control of the Teacher Education Council.

Procedure: Both theoretical and practical works are taken into consideration.

Expenses: The trainees must pay their own expenses.

Project: Analysis and Evaluation of the Curriculum of Teacher Education Council.

1. Principle and Rationale

Curriculum is seen as a means to achieve educational objectives. Without carefully structured curriculum, educational development is not likely to reach the goals that are intended. Curricula for various educational levels have been continuously reviewed and improved as to provide appropriate structure to educational development. In spite of this measure, the curriculum of teacher education has been a subject of fervent criticisms. The oft-sited are: teacher education curriculum is too academic, repetitive and irrelevant to students needs, also the objectives of the curriculum are not well defined.

One of the assumptions often forgotten by the critics is the on-going nature of curriculum development. The activities associated with curriculum development do not stop anywhere but form a cycle beginning from objectives, content, implementation, evaluation, adaptation and so on. Systematic evaluation is definitely a necessary component without which the objectives of curriculum development may not be fully realized. In the light of the fact that teachers colleges all over the country are in the process of implementing the curriculum of Teacher Education Council, an evaluation programme is therefore submitted for execution.

2. Objectives

The main objectives of the proposed programme are:

1. To analyze the curriculum in terms of suitability based on question data supplied by college administrators, teachers and student teachers.
2. To survey the problems of implementation viewed from the standpoint of administrators, teachers and student teachers.

3. Responsible Organization

A committee for analyzing and evaluating the curriculum of Teacher Education Council will be charged with the responsibility of running the proposed programme. Its members are to be drawn from the followings:

1. College administrators
2. College instructors

3. Supervisors

The committee is expected to report its findings and recommendations to Teacher Education Council.

Project: Village Teachers Project

Responsible organization: Seven Teachers Colleges

Principle and Rationale:

The project derives from the two previous projects which aimed at community development. This development needs persons who are acquainted with the community and its problems. In order to reach the goal, the Department of Teacher Education must train this kind of persons by creating a model village which is similar to the real one in a teachers college. It is expected that this model village will help students realize their community and know how to develop it.

Objectives:

1. To produce proper teachers for community development.
2. To teach students the subjects suitable for community development.
3. To teach students to become good leaders as well as good followers.

Procedure:

Step I Selection of the students for the model village.

Step II The provision of a real situation in a model village for those students to practice living together in it as a cooperative society.

Step III The study of special programme for community development.

Step IV The students practice associated with their teachers and rural personnel.

Duration: Four years are needed for the project.

The first year is the preparation period for the students selection for the model village.

The second and third years are the implementation period.

The fourth year is the follow-up period.

Research Project: Creative Thinking of Thai Children from Prathom 5 to Mathayom Suksa 3 (Grade 5 to Grade 10)

Rationale

1. Creative thinking is one of the most vital factors effecting the process of learning and problem solving at all levels. In an even and rapidly changing society such as Thailand, individuals who are capable of conceptualizing innovated ideas for developing and improving society are much needed. Thai children are to be studied and surveyed for the purpose of encouraging and reinforcing their creative thinking to full potential from early ages.

2. A comparative study on the creative thinking between Thai and American children conducted in 1976 and in U.S.A. reveals that Thai children in Grade 2 selected as a sampled group display creative thinking at higher levels than American children in the same age-group. This finding affords a ground work for a systematic study on creative thinking.

Objectives:

The objectives of this study are:

1. To survey Thai children's creative thinking from Prathom 5-Mathayom Suksa 3 levels.
2. To prepare a manual on scoring criteria for creativeness which comprises reflexiveness, flexibility and criticalness.
3. To measure norms of Thai children's creativity among Prathom 5-Mathayom Suksa 3 levels.
4. To compare the difference of Thai children's creative behavior among Prathom 5-Mathayom Suksa 3 levels.
5. To apply the research findings for improving teaching-learning process in general.

Project: Research on Linkage Relationship between Home Economics Curriculum of Teachers Colleges and the Curricula of Primary and Secondary Schools

Principle and Rationale

Home Economics curriculum for teachers colleges has been implemented since 1976 while Home Economics curricula for primary and secondary schools have recently been developed and introduced in 1978. The stages of development advanced by the implementation of these curricula permit a study on linkage relationship which will be used as a guideline for the future preparation of Home Economics teachers to meet the needs of primary and secondary schools.

Objectives

The objectives of the project are as follows:

1. To study the strength and the weakness of Home Economics curriculum of teachers colleges for the purpose of linking the curriculum of teachers colleges to those of primary and secondary schools.
2. To analyse Home Economics curricula of primary and secondary schools for the purpose of linking the curriculum of teachers colleges to those of primary and secondary schools.
3. To investigate inter-linkage of the curricula of all three levels.

Methodology

Questionnaires will be used to study and survey the following.

1. To investigate the distribution of weight for various topics both in depth and scope.
2. To survey the opinions of teachers, principals or senior instructors on the qualities of teaching Home Economics based on the curriculum of teachers colleges.
3. To survey the opinions of the graduates with major and minor in Home Economics.

Sample Groups

1. Home Economics instructors of teachers colleges.
2. Principals of primary and secondary schools.
3. Graduates of Home Economics curriculum from teachers colleges actively engaged in teaching Home Economics in primary and secondary schools.

Duration

The duration of the project is to last one year beginning from October and ending in September 1979.

Budget

The project costs are itemized as follows:

1. Designing questionnaire forms	7,000 baht
2. Preparation of survey forms	3,000 baht
3. Honorarium	5,000 baht
4. Miscellaneous	5,000 baht
5. Publication of report	<u>10,000 baht</u>
Total	<u>30,000 baht</u>

Project: Research on the Use of Library for Learning-Teaching Process
in Teachers Colleges

Principles and Rationale

Library is recognized as a highly essential instrument for the promotion of more efficient learning-teaching process in teachers colleges. At present each teachers college is equipped with at least one main library. However there is no information on the rate of use of library by instructors and students of teachers colleges, hence no comparison of the rates of use of library between small and large, old and new teachers colleges.

Objectives

The objectives of the project are as follows:

1. To investigate the rate of library used by the students on the basis of
 - 1.1 Major subjects
 - 1.2 The levels of study
2. To investigate the rate of library used by the instructors on the basis of
 - 2.1 Faculties to which they belong
 - 2.2 Qualifications
 - 2.3 Working experience
3. To study types of book used by students.
4. To study types of book used by instructors.
5. To investigate the peak loads of library and the types of books involved.
6. To investigate the relationships between provided library services and the rate of use by the students.
7. To compare the rates of use of library on the basis of
 - 7.1 Size of teachers college
 - 7.2 How long the teachers colleges have been in existence.

Sampled Group

The students and instructors of all 36 teachers colleges and librarians.

Methodology

1. Questionnaires
2. Direct observation

Duration

The duration can be phased as follows:

October 1, 1978 - November 1, 1978: Preparation of necessary re-
search tools.

September 16, 1978 - March 15, 1979: Data collection

March 6, 1978 - September 30, 1979: Data analysis and reporting.

Budgets

The research costs are itemized as follows:

1. Preparation of research tools	8,000 baht
2. Travelling	3,000 baht
3. Honorarium	7,000 baht
4. Publication	<u>35,000 baht</u>
Total	<u>80,000 baht</u>

TEACHERS COLLEGE ACT

B.E. 2518

Bhumiphol Adulyadej Rex

Granted on February 14, 2518. The thirtieth year of the reign.

By the grace of His Majesty King Bhumiphol Adulyadej, it is hereby declared that:

It is deemed appropriate that there shall be an act for teachers colleges.

Through the recommendation and consent of the Legislative Council acting on behalf of the House of Representatives the act shall read as follows:

Article I: This act shall be known as the Teachers College Act B.E. 2518.

Article II: The act shall become effective from the day the act is announced in the Royal Gazette.

Article III: In this act

"Teachers College" shall mean a college established in accordance with Article VI herein.

"Council" shall mean Teacher Training Council

"Rector" shall mean a rector of a Teachers College.

Article IV: The Ministry of Education shall be responsible for the implementation of this act.

Section 1

General

Article V. Teachers Colleges shall be institutes for education and research, the objectives of which are to provide education, produce teachers up to bachelor level, promote the professional and academic status of teachers and educational administrators, and support cultural and academic activities for the community.

Teachers Colleges shall be a governmental entity within the Department of Teacher Education in the Ministry of Education.

Article VI Should the Ministry of Education at any time deem it appropriate to establish a Teachers College in any location or to upgrade any teacher education institute to the status of a Teachers College, it shall present the recommendation to the Council for approval.

The establishment of any Teachers College or the upgrading of an institution to teacher education status as described in the preceding paragraph shall be declared by royal decree.

Article VII Each Teachers College shall have the following official bodies:

1. Rector's Office
2. Academic Faculties

The Rector's Office may be divided into various sections.

An Academic Faculty may be divided into various academic departments.

Article VIII The division of official bodies i.e. Rector's Office and Academic Department, or the dissolving of the same, shall be announced in the Royal Gazette by the Ministry of Education.

Article IX The Ministry of Education shall allocate the budget to the Department of Teacher Educations as it deems appropriate for the management of Teachers Colleges; which budget shall be specifically set up for the said purpose to the exclusion of any other programmes of the Department of Teacher Education

Budget, income, fees and donations bequeathed to the Department of Teacher Education for the purpose of managing Teachers Colleges shall be allocated for the purpose and the advantage of the Teachers Colleges by the Department of Teacher Education.

Any income received by the Department of Teacher Education from individual Teachers Colleges shall be exempted from the law governing budgeting procedures which requires it to be forwarded to the Ministry of Finance.

Section 2
Management

Article X There shall be a Teacher Education Council consisting of:

1. The Council Chairman, who shall be the Under-Secretary of the Ministry of Education by virtue of ex-officio.

2. The Vice-Council Chairman, who shall be the Director-General of the Department of Teacher Education by virtue of ex-officio.

3. The Council Members, who shall be the Director-Generals of the Department of Vocational Education and the Department of Educational Techniques, the representative of the Bureau of State Universities, the Deputy Director-General for Academic Affairs of the Department of Teacher Education, and the Chief of Teacher Education Division by virtue of ex-officio.

4. No more than six Council Members shall be elected from rectors.

5. No more than six Council Members, who shall be elected from the regular teaching staff.

6. No more than six distinguished Council Members who shall be appointed from non-civil servants by royal decree at the recommendation of the Chairman, the Vice-Chairman, and the Council members mentioned in (3), (4) and (5).

The Deputy Director-General for Academic Affairs of the Department of Teacher Education shall serve as the Secretary of the Council; the Chief of the Division of Teacher Education, the Assistant Secretary of the Council.

The Department of Teacher Education shall be responsible for the management of the Council.

Article XI The election of Council Members under Article X (4) herebefore shall be carried out by voting among Rectors of Teachers Colleges, while the election of Council Members under Article X (5) shall be carried out by voting among the regular teaching staff.

The regulations and procedures for electing Council Members shall be formulated into the Articles of Association of the Council.

Article XII Distinguished Council Members shall remain in office for two years but may be reelected by the Crown.

In the case of any distinguished Council Member leaving office before the completion of his term and an appointment being made to fill his place or the Crown appointing additional Council Members while current Council Members are still holding office, the Council Member so appointed shall remain in office for the remaining term of the Council Member already appointed before him.

Article XIII The Council shall have the power and the responsibility for the general management of the Teachers Colleges as follows:

1. To issue rules and regulations for Teachers Colleges, to stipulate qualifications and prerequisites for applicants seeking admission to a Teachers College and also to set forth the administrative structure of Teachers Colleges.
2. To approve curricula.
3. To effect ways and means of promoting training and research in Teachers Colleges.
4. To approve the granting of Degrees, diplomas and certificates.
5. To give recommendations pertaining to education, teacher education and any other educational issues as deemed appropriate by the Ministry of Education.
6. To review the establishment, the amalgamation and the dissolution of faculties and departments.
7. To review the establishment of Teachers Colleges and the upgrading of teacher education institutions.
8. To review the appointment, transfer and removal of the Rector, Deputy Rector, Head of Rector's Office, Deputy Head of Rector's Office, Head of Department, Assistant Professor or Associate Professor.
9. To set forth the regulations on the allocation of budgets and assets of Teachers Colleges.
10. To set up a committee that shall give advice and recommendations regarding the management of Teachers Colleges.

Article XIV The Chairman shall have the right to call a council meeting.

Should three Council Members or more recommend a meeting for a specific purpose, the Chairman shall call such meeting.

In the meeting of the Council, not less than one half of the Council Members shall be present at the meeting to make a quorum.

The Council Chairman shall be the chairman of the meeting. In the absence of the Chairman, the Vice-Chairman shall be the chairman of the meeting. In the absence of the Chairman and the Vice-Chairman, the chairman of the meeting shall be elected from the Council Members.

Article XV Any resolution shall be passed by a simple majority of votes, with each Council Member being entitled to one vote. Should the number of votes for and against be equal, the chairman of the meeting shall have an additional vote to rule on the outcome of the resolution.

Article XVI Each Teachers College shall have one Rector who shall be responsible for the general management of that Teachers College, and may have one or more Deputy Rectors who shall be responsible for tasks assigned by the Rector.

The Council shall present recommendations to the Crown for the appointment of a Rector from the teaching staff of a Teachers College. Such a Rector shall remain in office for four years, but may be reappointed by the Crown. No Rector may remain in office more than two consecutive terms. The recommendation for removing any Rector before the completion of his term shall be presented to the Crown.

The Deputy Rector shall be appointed from a member of the teaching staff by the Council on the recommendation of the rector, and shall remain in office for the remaining term of the current rector barring the removal of the said deputy rector before his term.

Article XVII The Rector and Deputy Rector shall hold a degree or the equivalent from Teachers Colleges, Universities or any other Institutions of Higher Learning approved by the Council.

Article XVIII In the case of the Rectorship becoming vacant or the Rector's failure to carry out his duty, the Deputy Rector shall become the Acting Rector, and in the case of there being more than one Deputy Rector, the Deputy Rector nominated by the Rector shall become the Acting Rector. In the absence of the Rector's nomination, the most senior Deputy Rector shall become the Acting Rector.

In the case of there being no Deputy Rector or the Deputy Rector's failure to carry out his duty, the Council shall nominate a Council Member to become the Acting Rector.

Article XIX Each Teachers College shall have a Teachers College Committee consisting of

1. A chairman who shall be the Rector by virtue of ex-officio.
2. A deputy chairman who shall be the Deputy Rector by virtue of ex-officio.
3. No less than nine committee members who shall be elected from the Chief of the Rector's Office, and Heads of Department.
4. Committee members of the same number as in (3) shall be elected from the teaching staff of the Teachers College.
5. Distinguished committee members of the same numbers as in (3) shall be elected from outsiders on the recommendation of the committee chairman and the committee members mentioned in (3) and (4) above.

The said distinguished committee members shall remain in office for two years but may be reelected.

The Chief of the Rector's Office shall be the secretary of the committee.

Article XX The election of committee members under Article XIX (3) shall be effected by voting among the Rector, the Deputy Rectors, the Heads of Department and the Chief of the Rector's Office, while the election of committee members under Article XIX (4) shall be effected by voting among the members of the teaching staff.

The procedures and regulations of the election under the first paragraph shall be formulated into the Article of Association of the Council.

Article XXI The committee elected under Article XIX shall have the responsibility and power as follows:

1. To set forth the regulations of the Teachers College for the approval of the Council.
2. To review the curriculum and matters related to the curriculum in order to present its recommendations to the Council.
3. To organize educational evaluation.
4. To serve as adviser and arbitrator to the Rector.

5. To prepare the budget to be presented to the Department of Teacher Education for the approval of the Council.

6. To prepare reports of work progress and yearly accounts.

Article XXII In the meeting of the committee formed under Article XIX, Articles XIV and XV shall be observed.

Article XXIII There shall be a Chief of the Rector's Office who is responsible for the management of the said office.

There shall be a Dean of Faculty who is responsible for the management of a Faculty.

There shall be a Head of Department who is responsible for the management of a Department.

There may be Deputy Chief(s) of the Rector's Office, Deputy Dean(s) of a Faculty or Deputy Head(s) of a Department as deemed necessary to assist in the management of their respective offices.

The election of a Dean of Faculty, a Deputy Dean of Faculty and Deputy Head of Department shall be made from the teaching staff of the Teachers College, and the same shall remain in office for four years but may be reelected. Under no circumstances shall be the same person hold office for more than two consecutive terms.

Article XXIV The teaching staff of a Teachers College shall consist of

1. Professors who may be either professors regularly assigned to the Teachers College or from outside the Teachers College.

2. Associate professors.

3. Assistant professors.

4. Lecturers who may be either lecturers regularly assigned to the Teachers College or from outside the Teachers College.

Article XXV Outside professors shall be appointed by the Crown from those who are not civil servants employed by the Teachers College.

Article XXVI Regular professors who complete their term of office free of any wrong doing shall be appointed professors emeritus.

Article XXVII A professor shall have the following qualifications:

1. Hold a doctorate degree or the equivalent in the academic subject taught in the Teachers College, from a University or any other Institute of Higher Learning approved by the Council and have been in

teaching service no less than five years in a Teachers College or a University or any other Institute of Higher Learning approved by the Council, and have conducted research recognized by the Council or produced work of academic excellence recognized and approved by the Council.

2. Hold a master's degree or the equivalent in the academic subject taught in the Teachers College from a University or any other Institute of Higher Learning approved by the Council and have been in teaching service no less than ten years in a Teachers College or a University or any other Institute of Higher Learning approved by the Council and have conducted research recognized by the Council or produced work of academic excellence recognized and approved by the Council.

3. Hold a bachelor's degree from a Teachers College or hold a bachelor's degree or the equivalent in the academic subject taught in the Teachers College from a University or any Institute of Higher Learning approved by the Council and have been in teaching service no less than fifteen years in a Teachers College or a University or an Institute of Higher Learning approved by the Council and have conducted research recognized by the Council.

4. Hold a bachelor's degree from a Teachers College or hold a bachelor's degree or the equivalent in the subject taught in the Teachers College or from a University or an Institute of Higher Learning approved by the Council and have conducted research recognized by the Council or produced beneficial academic work recognized and approved by the Council, or

5. An experienced expert in the subject taught in a Teachers College who had taught and conducted research in that subject for no less than twenty years to the satisfaction of the Council.

Article XXVIII An associate professor shall have the following qualifications:

1. Hold a doctorate degree or the equivalent in the subject taught in the Teachers College from a University or any Institute of Higher Learning approved by the Council and have been in teaching service no less than three years in a Teachers College or a University or any other Institute of Higher Learning approved by the Council, and

have conducted research recognized by the Council or produced work of academic excellence recognized and approved by the Council.

2. Hold a master degree or the equivalent in the subject taught in the Teachers College from a University or any Institute of Higher Learning approved by the Council and have been in teaching service no less than seven years in a Teachers College or a University or any other Institute of Higher Learning approved by the Council and have conducted research or produced work of academic excellence recognized and approved by the Council.

3. Hold a bachelor's degree from a Teachers College or hold a bachelor's degree or the equivalent in the subject taught in the Teachers College from a University or any other Institute of Higher Learning approved by the Council and taught in a Teachers College or a University or any Institute of Higher Learning approved by the Council for no less than ten years and have conducted research recognized by the Council or produced work of academic excellence recognized and approved by the Council, or

4. An experienced expert in the subject taught in a Teachers College who has taught and conducted research in that subject for no less than fifteen years to the satisfaction of the Council.

Article XXIX Assistant professor shall have the following qualifications:

1. Hold a doctorate degree or the equivalent in the subject taught in a Teachers College from a University or from any Institute of Higher Learning approved by the Council and have been in teaching service no less than two years in a Teachers College or a University or any other Institute of Higher Learning approved by the Council.

2. Hold a master's degree or the equivalent in the subject taught in a Teachers College from a University or any Institute of Higher Learning recognized by the Council and have taught no less than four years in a Teachers College or a University or any Institute of Higher Learning recognized by the Council.

3. Hold a bachelor's degree from a Teachers College or hold a bachelor's degree or the equivalent in the subject taught in a Teachers College from a University or any Institute of Higher Learning recog-

nized by the Council and have taught no less than seven years in a Teachers College or a University or any Institute of Higher Learning recognized by the Council or,

4. An experienced expert in the subject taught in a Teachers College who has taught and conducted research in that subject for no less than fifteen years to the satisfaction of the Council.

Article XXX A regular lecturer shall hold a bachelor's degree from a Teachers College or hold a bachelor's degree or the equivalent from a University or any Institute of Higher Learning recognized by the Council, or be an expert in the subject taught in the Teachers College.

An outside lecturer may be appointed from those with the same qualifications as a regular lecturer by the Rector from time to time, for each academic year, with the approval of the Council.

Section 3

Degree and Degree Acronym

Article XXXI The Council shall have the power to award a bachelor's degree in the subject taught in the Teachers College.

The description of the degree in any subject, its acronym and the major subject for that degree in the bracket form after the acronym shall be announced by royal degree.

Article XXXII The Council may issue regulations to award first-class and second-class honour degrees to those who complete a degree course.

Article XXXIII The Council may issue regulations to award diplomas and certificates as follows.

1. Diplomas or certificates for those who do not complete a degree course.

2. Certificates for those who do not complete a degree course.

Article XXXIV The Council shall have the power of awarding honorary degrees to suitable persons. Under no circumstances shall the honorary degree be awarded to those who sit in the Council or the Committee of Teachers College at the time of the award.

Article XXXV The Council shall cause to have made gowns and badges corresponding to the academic achievements of those receiving a bachelor's degree, certificate and diploma.

The description of types and kinds of gowns and badges shall be made in a royal decree.

The employment of gowns and badges shall be in accordance with the requirements of the Council.

Article XXXVI The Council may issue regulations pertaining to uniform, emblems and dress of the students of a Teachers College, such regulations to be announced in the Royal Gazette.

Section 4

Penalty for Misrepresentation

Article XXXVII Any person who makes improper use of gown, badge, uniform, emblem or dress of the students of a Teachers College or improperly carries out any action suggesting the right of holding a degree, certificate or diploma from a Teachers College for the purpose of misleading others to believe that he has the said right shall be liable to imprisonment for a term no longer than six months or a fine of no less than one thousand baht or both.

Provisional

Article XXXVIII During the time when no Rector and no Council Members have yet been appointed by the Crown, the Council shall consist of Council Members under Article X (1) (2) (3) and the Rectors of Teachers Colleges who are already engaged in the teaching of a degree course.

The Deputy-Director for Academic Affairs of the Department of Teacher Education shall be the Secretary of the Council, and the Chief of Teacher Education Division, the Assistant Secretary of the Council.

Article XXXIX The administration of education and curricula of Teacher Education Institutions prior to the date of the implementation of the

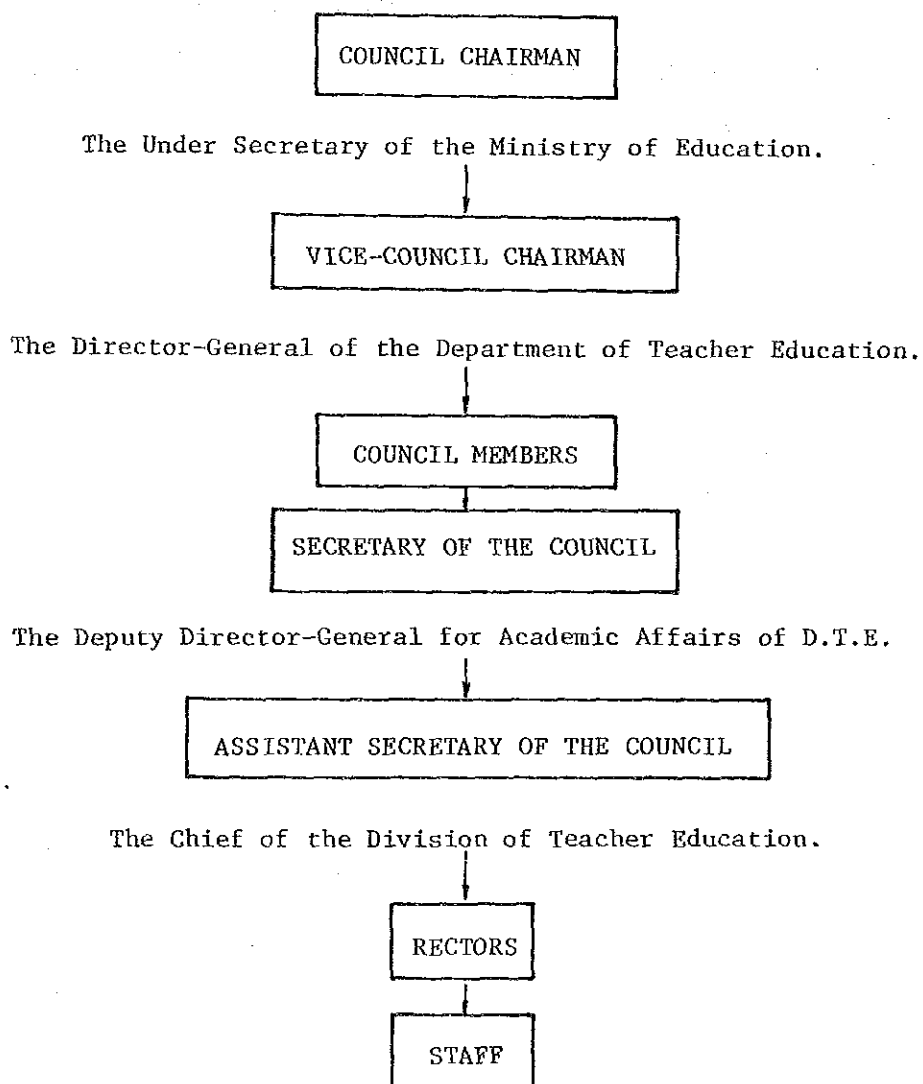
Act shall be deemed as the administration of education and curricula of the Council in accordance with this Act.

Observer of the Royal Command

Sanya Dhamasak

Prime Minister

FUNCTIONAL CHART



An Introduction to the Department of Teacher Education

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Any cooperation is highly appreciated by the Division of Planning.

參考資料 5

An Introduction
to
Petchburi Teachers College (1979)

The college is situated at 38/8 Had Chao Sumran road, Nawoeng district, Petchburi province.

Tel. 425118, 425530

Symbol of the college ; diamond

Color of the college ; green-yellow

Motto; "What things you do that things you'll receive" or "If you do well, you'll get well".

Rector of the college: Mr. Saei Kurtcharoen

Deputy of administration: Mr. Lom Pengkaow

Deputy of student activities: Mr. Saward Roangsri

The college's composition

1. Office of administration

Head: Mr. Winid Christatai

2. Faculty of humanity and social study

Head: Mr. Sanit Boonsong

3. Faculty of sciences

Head: Mr. Vera Boonchaiya

4. Faculty of education

Head: Mr. Prateep Pewchum

The system of teaching: there are 3 semesters in a year.

There are 18 weeks in the Ist and the IInd semesters.

In summer semester there are 8 weeks.

Ist semester: June - October

IInd semester: November - March

Summer semester: April - May

Educational Offering

1. Certification in higher education

2. Bachelor's degree in education

Curriculum

1. There are 70 credits in certification in higher education, (Fundamental subjects 24 credits, professional subjects 24 credits, specific subjects 22 credits) which must be taken in at least 4 semesters.

(No classes in summer semester for full time student)

2. Bachelor degree in education. There are 65 credits (Fundamental subjects 14 credits, professional subjects 18 credits, specific subjects 27 credits, elective subjects 6 credits) which must be taken in at least 4 semesters. (No classes in summer semester for full time student)

The requirement of students

1. Certification in higher education requires the student who graduates from high school or the same educational level.

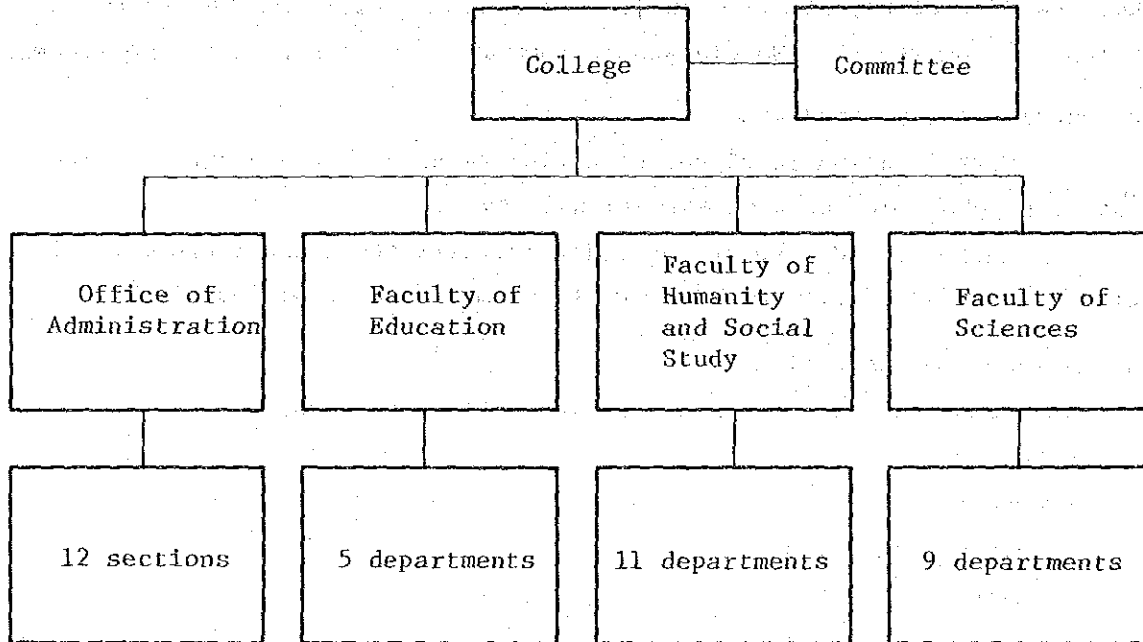
2. Bachelor's degree in education requires the student who took the certification in higher education or the same educational level.

The college administration

The committee of the administrative college is composed of

- Rector
- Deputy
- Head of Faculties
- Invited members
- Elective members
- Secretary: Head of administrative office

Diagram of the college administration



The college personnel

Teacher	194
Employee	74
Student	2,073

The list of departments in faculties

1. Faculty of Education

- 1.1 Department of foundation of education
- 1.2 Department of curriculum and teaching methods
- 1.3 Department of psychology and guidance
- 1.4 Department of innovation of educational technology
- 1.5 Department of evaluation and education research

2. Faculty of Humanity and Social Study

- 2.1 Department of Thai
- 2.2 Department of English
- 2.3 Department of art education
- 2.4 Department of music education
- 2.5 Department of Drama

- 2.6 Department of philosophy and religion
- 2.7 Department of social science
- 2.8 Department of economics and politics
- 2.9 Department of history
- 2.10 Department of geography
- 2.11 Department of library science
- 3. Faculty of Sciences
 - 3.1 Department of mathematics
 - 3.2 Department of physics and general science
 - 3.3 Department of chemistry
 - 3.4 Department of biology
 - 3.5 Department of agriculture
 - 3.6 Department of industrial arts
 - 3.7 Department of home economics
 - 3.8 Department of health education
 - 3.9 Department of physical education and recreation
- 4. Office of Administration
 - 4.1 Section of executive administration
 - 4.2 Section of finance
 - 4.3 Section of planning and evaluation
 - 4.4 Section of goods
 - 4.5 Section of services (general services)
 - 4.6 Section of buildings and area
 - 4.7 Section of register
 - 4.8 Section of health and sanitation
 - 4.9 Section of educational services
 - 4.10 Section of library
 - 4.11 Section of guidance (service)
 - 4.12 Section of audio-visual

Land, Building and etc.

Land: 265 rai = 0.4 Km² 0.4 x 10⁶ m² = 4 x 10⁵ m²

Buildings: No. 1 Thai & English
 No. 2 Social study
 No. 3 Administration office
 No. 4 Science study
 No. 5 Store and stage room

- No. 6 Library building
- No. 7 Science study
- No. 8 Educational study
- No. 9 Agriculture building
- No.10 Gymnasium

Auditorium (Cafeteria)	2 buildings
Domitory	10
Teacher's club	1
Teacher's house	103
Worker's house	9
Building of water supply	1
Cars	11

JICA

