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NH-52, Namsai, Arunachal Pradesh -792103

## **BACHELOR OF SCIENCE BACHELOR OF EDUCATION (PCM) – FOURTH SEMESTER**

<b>Fourth Semester</b>			
<b>S. No.</b>	<b>Name of Subject</b>	<b>Credits</b>	<b>Total Marks</b>
1	Waves and Optics	4	100
2	Waves and Optics Lab	3	100
3	Transition Metal & Coordination Chemistry, States of matter & Chemical kinetics	4	100
4	Transition Metal & Coordination Chemistry, States of matter & Chemical kinetics Lab	3	100
5	Algebra	6	100
6	Basic Analytical Chemistry	4	100
7	Understanding Disciplines and Subjects	4	100
8	Learning and Teaching	4	100
<b>Total</b>		<b>32</b>	

**Subject Name:** WAVES AND OPTICS

**Superposition of Two Collinear Harmonic oscillations:** Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats).

**Superposition of Two Perpendicular Harmonic Oscillations:** Graphical and Analytical Methods. Lissajous Figures with equal and unequal frequency and their uses.

**Waves Motion- General:** Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity.

**Fluids:** Surface Tension: Synclastic and anticlastic surface - Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaeger's method. Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Variations of viscosity of a liquid with temperature lubrication. Physics of low pressure - production and measurement of low pressure - Rotary pump - Diffusion pump - Molecular pump - Knudsen absolute gauge - penning and pirani gauge – Detection of leakage.

**Sound:** Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels - Intensity levels - musical notes - musical scale. Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient - Sabine's formula - measurement of reverberation time - Acoustic aspects of halls and auditoria.

**Wave Optics:** Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.

**Interference:** Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.

**Michelson's Interferometer:** Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index and Visibility of fringes.

**Diffraction:** Fraunhofer diffraction: Single slit; Double Slit. Multiple slits & Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. (14 Lectures)

**Polarization:** Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization. (5 Lectures)

**Reference Books:**

- Fundamentals of Optics, F A Jenkins and H E White, 1976, McGraw-Hill
- Principles of Optics, B.K. Mathur, 1995, Gopal Printing
- Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication
- University Physics. FW Sears, MW Zemansky and HD Young 13/e, 1986. Addison-Wesley

**Subject Name:** WAVES AND OPTICS -LAB

1. To investigate the motion of coupled oscillators
2. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify  $\lambda^2 - T$  Law.
3. To study Lissajous Figures
4. Familiarization with Schuster's focussing; determination of angle of prism.
5. To determine the Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
6. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
7. To determine Dispersive Power of the Material of a given Prism using Mercury Light
8. To determine the value of Cauchy Constants of a material of a prism.
9. To determine the Resolving Power of a Prism.

10. To determine wavelength of sodium light using Fresnel Biprism.
11. To determine wavelength of sodium light using Newton's Rings.
12. To determine the wavelength of Laser light using Diffraction of Single Slit.
13. To determine wavelength of (1) Sodium & (2) spectrum of Mercury light using plane diffraction Grating
14. To determine the Resolving Power of a Plane Diffraction Grating.
15. To measure the intensity using photosensor and laser in diffraction patterns of single and double slits.

**Reference Books:**

- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

**Subject Name:** TRANSITION METAL & COORDINATION CHEMISTRY, STATES OF MATTER & CHEMICAL KINETICS

***Section A: Inorganic Chemistry***

**Transition Elements (3d series)**

General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.

Lanthanoids and actinoids: Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only).

**Coordination Chemistry**

Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6.

Drawbacks of VBT. IUPAC system of nomenclature.

**Crystal Field Theory**

Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry.

Jahn-Teller distortion, Square planar coordination.

***Section B: Physical Chemistry***

## **Kinetic Theory of Gases**

Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation.

Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrews isotherms of CO<sub>2</sub>.

Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance.

Temperature dependence of these distributions. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity (qualitative treatment only).

## **Liquids**

Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

## **Solids**

Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices. X-Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals. Glasses and liquid crystals.

## **Chemical Kinetics**

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation.

Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).

## **Reference Books:**

- Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
- Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi (2009).
- Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
- Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York (1985).

- Cotton, F.A. & Wilkinson, G. Basic Inorganic Chemistry, Wiley.
- Shriver, D.F. & Atkins, P.W. Inorganic Chemistry, Oxford University Press.
- Wulfsberg, G. Inorganic Chemistry, Viva Books Pvt. Ltd.
- Rodgers, G.E. Inorganic & Solid State Chemistry, Cengage Learning India Ltd., 2008.

**Subject Name:** TRANSITION METAL & COORDINATION CHEMISTRY, STATES OF MATTER & CHEMICAL KINETICS-LAB

### **Section A: Inorganic Chemistry**

Semi-micro qualitative analysis (using H<sub>2</sub>S or other methods) of mixtures - not more than four ionic species (two anions and two cations, excluding insoluble salts) out of the following:

Cations : NH<sub>4</sub><sup>+</sup>, Pb<sup>2+</sup>, Bi<sup>3+</sup>, Cu<sup>2+</sup>, Cd<sup>2+</sup>, Fe<sup>3+</sup>, Al<sup>3+</sup>, Co<sup>2+</sup>, Ni<sup>2+</sup>, Mn<sup>2+</sup>, Zn<sup>2+</sup>, Ba<sup>2+</sup>, Sr<sup>2+</sup>, Ca<sup>2+</sup>, K<sup>+</sup>

Anions : CO<sub>3</sub><sup>2-</sup>, S<sup>2-</sup>, SO<sub>3</sub><sup>2-</sup>, S<sub>2</sub>O<sub>3</sub><sup>2-</sup>, NO<sub>3</sub><sup>-</sup>, CH<sub>3</sub>COO<sup>-</sup>, Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>, NO<sub>2</sub><sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, PO<sub>4</sub><sup>3-</sup>, BO<sub>3</sub><sup>3-</sup>, C<sub>2</sub>O<sub>4</sub><sup>2-</sup>, F<sup>-</sup>

(Spot tests should be carried out wherever feasible)

1. Estimate the amount of nickel present in a given solution as bis(dimethylglyoximate) nickel(II) or aluminium as oximate in a given solution gravimetrically.
2. Estimation of (i) Mg<sup>2+</sup> or (ii) Zn<sup>2+</sup> by complexometric titrations using EDTA.
3. Estimation of total hardness of a given sample of water by complexometric titration.

### **Section B: Physical Chemistry**

(I) Surface tension measurement (use of organic solvents excluded).

- a) Determination of the surface tension of a liquid or a dilute solution using a stalagmometer.
- b) Study of the variation of surface tension of a detergent solution with concentration.

(II) Viscosity measurement (use of organic solvents excluded).

- a) Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer.
- b) Study of the variation of viscosity of an aqueous solution with concentration of solute.

(III) Chemical Kinetics

Study the kinetics of the following reactions.

1. Initial rate method: Iodide-persulphate reaction
2. Integrated rate method:

- a. Acid hydrolysis of methyl acetate with hydrochloric acid.
- b. Saponification of ethyl acetate.
- c. Compare the strengths of HCl and H<sub>2</sub>SO<sub>4</sub> by studying kinetics of hydrolysis of methyl acetate

**Reference Books:**

- Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
- Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
- Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).

**Subject Name:** ALGEBRA

Definition and examples of groups, examples of abelian and non-abelian groups, the group  $Z_n$  of integers under addition modulo  $n$  and the group  $U(n)$  of units under multiplication modulo  $n$ . Cyclic groups from number systems, complex roots of unity, circle group, the general linear group  $GL_n(n, R)$ , groups of symmetries of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group  $Sym(n)$ , Group of quaternions.

Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the center of a group. Cosets, Index of subgroup, Lagrange's theorem, order of an element, Normal subgroups: their definition, examples, and characterizations, Quotient groups.

Definition and examples of rings, examples of commutative and non-commutative rings: rings from number systems,  $Z_n$  the ring of integers modulo  $n$ , ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions. Subrings and ideals, Integral domains and fields, examples of fields:  $Z_p$ ,  $Q$ ,  $R$ , and  $C$ . Field of rational functions.

**Books Recommended**

1. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
3. Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.
4. George E Andrews, Number Theory, Hindustan Publishing Corporation, 1984.

**Subject Name:** BASIC ANALYTICAL CHEMISTRY

**Introduction:** Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.

**Analysis of soil:** Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators

- a. Determination of pH of soil samples.
- b. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

**Analysis of water:** Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.

- a. Determination of pH, acidity and alkalinity of a water sample.
- b. Determination of dissolved oxygen (DO) of a water sample.

**Analysis of food products:** Nutritional value of foods, idea about food processing and food preservations and adulteration.

- a. Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.
- b. Analysis of preservatives and colouring matter.

**Chromatography:** Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

- a. Paper chromatographic separation of mixture of metal ion ( $\text{Fe}^{3+}$  and  $\text{Al}^{3+}$ ).
- b. To compare paint samples by TLC method. Ion-exchange: Column, ion-exchange chromatography etc.

Determination of ion exchange capacity of anion / cation exchange resin (using batch procedure if use of column is not feasible).

**Analysis of cosmetics:** Major and minor constituents and their function

- a. Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.
- b. Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

**Reference Books:**

- Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. Instrumental Methods of Analysis. 7th Ed. Wadsworth Publishing Co. Ltd., Belmont, California, USA, 1988.
- Skoog, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Ed.
- Skoog, D.A.; West, D.M. & Holler, F.J. Fundamentals of Analytical Chemistry 6th Ed., Saunders College Publishing, Fort Worth (1992).
- Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman.
- Dean, J. A. Analytical Chemistry Notebook, McGraw Hill.
- Day, R. A. & Underwood, A. L. Quantitative Analysis, Prentice Hall of India.
- Freifelder, D. Physical Biochemistry 2nd Ed., W.H. Freeman and Co., N.Y. USA (1982).
- Cooper, T.G. The Tools of Biochemistry, John Wiley and Sons, N.Y. USA. 16 (1977).
- Vogel, A. I. Vogel's Qualitative Inorganic Analysis 7th Ed., Prentice Hall.
- Vogel, A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Prentice Hall.

- Robinson, J.W. Undergraduate Instrumental Analysis 5th Ed., Marcel Dekker, Inc., New York (1995).

**Subject Name:** UNDERSTANDING DISCIPLINES AND SUBJECTS

**Unit I: Knowledge and Methods of Enquiry**

- Disciplinary Knowledge :Nature and Scope,
- Interdisciplinary Knowledge: Nature ,Scope and Need
- Knowledge as Construction of Experience; Case examples from School Subjects
- Knowledge as distinct from Information;Case examples from School Subjects
- Methods of Inquiry, Scientific Thinking, Social Scientific Thinking, Mathematical Thinking, Critical Thinking
- Language, Social Relations, Power, Identity and Thinking(Relationship and Interface with Knowledge).

**Unit II: Learner and their Contexts**

- Interface between Knowledge, Subjects ,Curriculum, Textbooks, Linguistic background of learners
- Alternative Frameworks of Children.s Thinking
- Child and Adult Misconceptions: Meaning, Scope in a Classroom, Processes to be used to Dispel Misconceptions.
- Everyday Concepts and Situated Cognition
- Pedagogical Perspective and Concerns of Inclusive Education in Schools

**Unit III: Pedagogic Practice and the Process of Learning**

- Critical Examination of Terminology and Notions associated with Child-centered Education
- Critical understanding of standardised pedagogic methods: concept-formation; enquiry based learning; project-based learning etc
- Interrogating disciplinary practices and Creating non-threatening learning environments: Relevance, Scope and Process

**Unit IV: Critical Study of ICTs and Developing Capacities**

- Critical examination of the role of ICT in Effective Curriculum Transaction and Evaluation
- Capacity development of teachers and Students in the use of ICTs
- ICT - based teaching-learning approaches in schools
- Role of Open and Distance Learning in Catering to Diversity in Learners and Learning Styles.

**Suggested Readings:**

- Batra, P. (Ed.) (2010). *Social Science Learning in Schools: Perspective and Challenges*. New Delhi: Sage.
- Bruner, J. (1996). In *The Culture of Education*. Cambridge: Harvard University Press, 2: Folk Pedagogy, 44-65.
- Dewey, J. (1897). *My Pedagogic Creed*. School Journal, Vol. 54.



- Driver, R. (1981). Pupils' Alternative Frameworks in Science. *European Journal of Science Education*. 3(1), 93-101.
- Holt, J. (1990). *Learning All the Time*. New York: Addison-Wesley Publishing Co.

**Subject Name: LEARNING AND TEACHING**

**Unit I: Understanding the Learner**

- Dimensions of differences in psychological attributes-cognitive abilities, interest, aptitude, creativity, personality, values & Self Esteem.
- Understanding learners from the perspective of multiple intelligences with a focus on Gardner's theory of multiple intelligences. Implications for teaching- learning in the light of changing concept of intelligence, including emotional intelligence.
- Differences in learners based on predominant 'learning styles'.
- Differences in learners based on socio-cultural contexts: Impact of home language of learners' and language of instruction, impact of differential 'cultural capital' of learners.
- Understanding differences based on range of cognitive abilities---learning difficulties, slow learners and dyslexics, intellectual deficiency, intellectual giftedness. Implications for catering to individual variations in view of 'difference' rather than 'deficit' perspective.

**Unit II: Understanding Learning**

- Implicit knowledge and beliefs about learning (demystifying misconceptions).
- Perspectives on human learning: Behaviourist (conditioning paradigm in brief), cognitivist, information-processing view, humanist, social- constructivist (drawing selectively on the ideas of Skinner, Piaget, Rogers, Vygotsky).
  - I. Concepts and principles of each perspective and their applicability in different learning situations.
  - II. Relevance and applicability of various theories of learning for different kinds of learning situations.
  - III. Role of learner in various learning situations, as seen in different theoretical perspectives.
  - IV. Role of teacher in teaching-learning situations: a) transmitter of knowledge, b) facilitator, c) negotiator, d) co-learner.

**Unit III: Learning in 'Constructivist' Perspective**

- Distinctions between learning as 'construction of knowledge' and learning as 'transmission and reception of knowledge'.
- Social-constructivist perspective (also Bruner and Ausubel's perspective) and applications of Vygotsky's ideas in teaching.
- Understanding processes that facilitate 'construction of knowledge':
  - (i) Experiential learning and reflection
  - (ii) Social mediation
  - (iii) Cognitive negotiability

(iv) Situated learning and cognitive apprenticeship

(v) Meta-cognition.

- Creating facilitative learning environments, teachers' attitudes, expectations – enhancing motivation, positive emotions, self-efficacy, collaborative and self regulated learning.
- Utilizing learners experiences (in and outside school) in classroom process.

#### **Unit IV: Understanding Teaching**

- What is meant by teaching (teaching as a practice, activity and performance).
- Teaching as a complex activity,
  - how not to conceive teaching as a skill
  - teaching, personality and character
  - Reflective Teaching
  - teaching in a diverse classroom (addressing the diversity of student in classroom.

Diversity in cognitive abilities learning styles diversity due to socio-cultural context language diversity, differences resulting from disabilities, gender difference, diversity of student at risk.

-teacher as a critical pedagogue.

#### **Unit V: Teaching as a Profession**

- Is teaching a profession (Basic characteristics of teaching qualifying it as a profession.
- Professional development of teachers.
  - Need (link between professional development of teacher and substantial school improvement and student learning).
  - Phases of Professional Development (Pre-service and In-service).
  - Strategies
    - (i) Conventional face to face (through various institutions).
    - (ii) School based INSET.
    - (iii) Action Research
    - (iv) Collaborative problem solving.
    - (v) Self initiated learning.
    - (vi) Facilitating professional development
- Teacher Autonomy and Accountability.

#### **Suggested Readings**

1. Bhutt, H. The dairy of a school teacher: An Azim Prenji university publications, [www.arvindguptatoys.com/arvindgupta/diary - school teacher- eng.pdf](http://www.arvindguptatoys.com/arvindgupta/diary - school teacher- eng.pdf)
2. Burden, Paul R; Byrd, David. M. (1999). *Methods for Effective Teaching (Sec Edition)*, Allyn and Bacon.
3. Carr, D (2005), *Making sense of education: An introduction to the philosophy and theory of education and teaching*, Rontledge.
4. Delpit, L (2006). *Other people's children, cultural conflict in the classroom*. The New press.
5. Dhar, T.N. (Ed). 1996. *Professional status of Teachers*, NCTE, New Delhi.
6. Kauchak, D. P and Eggen, P. D (1998). *Learning and Teaching, : Research based methods*, Boston: Allyn and Bocan
7. Ladsen – Billings, G (1995). *Toward a theory of culturally relevant pedagogy*. *American Educational Research Journal*, 32 (3), 465-491.
8. Lampert, M. (2001). *Teaching problems and the problems of teaching*. Yale University press.
9. NCERT (2005). *National Curriculum Framework*, New Delhi
10. Olson, D.R. & Bruner, J.S. (1996). "Folk Psychology and Folk Pedagogy". In D.R. Olson & N. Torrance (Eds.). *The Handbook of Education and Human Development* (PP.9-27). Blackwell.
11. Piaget, J. (1997). "Development and Learning", In M. Gauvain & M. Cole (Eds.), *Reading on the Development of Children*. New York: WH Freeman & Company.
12. Rogeff, B; Baker-Sennatt, T., Lacasa, P. and Goldsmith, D. (1995). *Development through participation in socio-cultural activity*, *New Directions for child and adolescent development*, 1995 (67), 45-65.
13. Shulman, L.S. (1986). *Those who understand: Knowledge growth in teaching*. *Educational Researcher*, 4-14.
14. Vygotsky, L. (1997). "Interaction between Learning and Development", In M. Gauvain & M. Cole (Eds.) *Reading on the Development of Children*, New York: WH Freeman & Company.