

A Vision for Tomorrow

The Two-Year College in the Twenty-First Century

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A Community Vision for Two-Year College Physics Faculty

"As two-year college members of the physics community, we need to actively communicate and promote our belief that physics is an important part of all students' education. Further, we believe that physics teachers who regularly communicate with each other can share ideas and provide a better set of learning opportunities for their students. Our network of physicists will sustain local and national conversations and activities about methods and styles of learning and teaching. These conversations and activities will support scholarship that is widely available, easily accessible and invites comment and collaboration."

This statement was drafted and adopted as a community vision for two-year college physics faculty by the participants at the TYC21 meeting, "A Vision for Tomorrow," on April 11, 1999 in Fort Worth, TX.

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Overview

The Two-Year College in the Twenty-First Century: Breaking Down Barriers (TYC21) will improve the quality of physics education in the United States by developing and enhancing communication among two-year college physics faculty.

Thus began the vision of the TYC21 project drafted by the nine member Steering Committee in the Spring of 1995 during the launching phase of the four year American Association of Physics Teachers program funded by the National Science Foundation.

During the past four years, the AAPT program has successfully developed a

national network of fifteen regional networks, involving more than 500 two-year college (TYC) physics faculty. The activities addressing the program goals of professional development and community empowerment formed the basis for the collaborations. In addition TYC21 has organized and hosted more than one hundred regional meetings and five national meetings and has produced ten white papers addressing introductory physics education and professional development among two-year college physics faculty.

During the past year of TYC21, the PIs gave much thought to the self-sustaining aspect of the coalition of local networks. The project has given structure and reasons for regions to convene local activities during the four years and formed a basis for cohesion among the regions nurtured during the national summer meetings. During the Fall 1998, TYC21 project directors and steering committee had the opportunity to study regional activities and communications, not funded by the project. While the majority of the regions continued to have local meetings beyond the time defined by the project, those regions paid more attention to regional goals when organizing local activities and defined reasons for communication appeared to have a higher degree of success. TYC21 leaders also concluded that the factors contributing to the success of regional networks are the factors which will contribute to the success of the national network.

In anticipation of the end of project funding from the NSF Division of Undergraduate Education during the year 2000, TYC21 invited demonstrated leaders from among the TYC physics community to attend a weekend meeting near Dallas, Texas on April 9-11, 1999. Among the forty participants were coordinators from the fifteen TYC21 regions, the project's steering committee, and the members of the AAPT Committee on Physics in the Two-Year College. The project directors convened the meeting as a forum of representatives from the TYC physics community with the task of defining the directions for our community as we move into the next century. The focus of the meeting was threefold: (1) to enhance regional networking; (2) to define a vision for the TYC physics community for the next five years; and (3) to define areas for action whereby TYC physics faculty can impact student learning in all classrooms.

A review of the program agenda reveals the weave of the sessions addressing the three foci or goals: Session 2 and Poster Sessions 1 and 2 addressed the enhancement of regional networking; Session 3, 4, 6, 7 and 8 addressed the development of the community vision; and Sessions 1, 3, 5, 6, 7 and 9 addressed the definition of areas for action by the TYC physics community. The sequence of sessions provided a mental variety while providing complementary actions leading to successful completion of the defined outcomes.

Project directors asked participants, both by e-mail and snail mail (see Appendix

A), to complete two assignments prior to the April Meeting. Assignment 1 asked regional leaders to come to the meeting prepared to make posters describing his/her regional vision and goals for the next three years. The second assignment asked each participant to review the Executive Summary of the TIMSS report and identify what implications the report has for TYC faculty.

During the weekend meeting, the regions shared their local visions and goals formulated at the local level, discussed new resources for regional networking and shared new strategies for implementing current resources. As a community, the TYC physics faculty defined a common Vision (see inside front cover of proceedings) and five areas for nationwide action to be addressed during the next five years and leading into the 21st century. The following statement taken from that Vision expresses the unity of purpose shared by everyone attending the TYC21 meeting:

We believe that physics teachers who regularly communicate with each other can share ideas and provide a better set of learning opportunities for their students.

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Meeting Goals

Goal 1:

Identify resources which will enhance regional networking.

Outcomes:

- Report the activities of the regional meetings during the Fall of 1998 and Spring of 1999.
- Report regional goals (3) for the next three years. RCs will ask regions to develop these prior to the April Meeting and will share them during the April meeting.
- Each regional coordinator will describe and share the resources found most effective in encouraging intra-region networking.
- Define strategy for the implementation of one new resource.

- Define strategy for a different implementation of an old resource.

Goal 2:

Define the role of our national network in meeting the needs of the individual TYC faculty member and the general physics teaching community.

Outcomes:

- The meeting participants will develop a mission statement.
- The meeting participants will develop a vision statement for the national network.

Goal 3:

Solidify the national network by extending activities across regional boundaries.

Outcomes:

- The participants will develop strategies to further develop cross-regional activities.
- The participants will identify and cultivate ideas for potential projects utilizing the TYC regional and national networks.

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Meeting Agenda

American Airlines Training and Conference Center Fort Worth, Texas

Friday, April 9, 1999

Registration

5-7 p.m.

Lobby of Americana

Reception

7-8 p.m. Americana

Session 1 - Focus on the Student Dinner

8-10 p.m. Americana

Welcome, Mary Beth Monroe

Working Group Assignments, Marvin Nelson

Adjourn

10 p.m.

Saturday, April 10, 1999

Continental Breakfast

7-8 a.m. Lobby of M104

Poster Preparations and Set-up

8-9 a.m. M104

Session 2 - Focus on the Regions;

Regional Resources: A Panel Discussion

9-10:15 a.m. M104

Coordinator, Marvin Nelson

Break and Stroll: Poster Session Review 1

10:15 - 11:15 a.m. M104

Session 3 - Focus on the TYC Community

11:30 a.m. - 12:30 p.m. M104

Coordinator, Mary Beth Monroe

Speaker: Mike Neuschatz, American Institute of Physics

"Findings from the Two Year College Survey"

Lunch

12:30 - 1:30 p.m. Black Hawke Dining Room

Session 4 - A National Vision

1:30-3:00 p.m. M104

Breakout Groups 1 M105, M110

Coordinator, Mary Beth Monroe

3-3:20 p.m. In front of M104

Session 5 - Implementing Best Ideas

3:20-5:00 p.m. M104, M105, M110

Breakout Groups 2

Coordinator, Marv Nelson

Dinner

5:30-7 p.m. Black Hawke Dining Room

Session 6 - Work Time

7-10 p.m. M104, M105, M110

Adjourn

10:00 p.m.

Sunday, April 11, 1999

Eat and Stroll - Continental Breakfast and
Poster Session 2; Check-out Time

7:00-8:30 a.m. M104

Session 7 - The National Vision,
Working Group Reports

8:30-9:30 a.m. M104

Coordinator, Mary Beth Monroe

Break

9:30-9:50 a.m. In front of M104

Session 8 - Planning for Tomorrow

9:50-10:50 a.m. M104

Coordinator, Mary Beth Monroe

Speaker: Paul D'Alessandris, CPTYC Chair

Session 9 - Implementing Best Ideas,
Reports from Breakout Groups 2

10:50-11:30 a.m. M104

Coordinator, Marvin Nelson

Session 10 - Closing Remarks

11:30-Noon

M104

Marvin Nelson and Mary Beth Monroe

Lunch

Noon-1 p.m.

Black Hawke Dining Room

Adjourn

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Focus One: Enhancing Regional Networking

During the conception of TYC21, the principal investigators defined the major outcome of the project to be the formation of fifteen regional networks, self-sustaining but linked together as a program of the American Association of Physics Teachers. During the interim between the termination of funding to the regions in September, 1998 and the April, 1999 Meeting, the project realized this outcome on a short term as eleven of the fifteen regions reported continuing activities.

At the close of National Meeting Three, August, 1998, all regions had submitted plans for local activities through this past academic year. Evidently some regions realized more success than others. In a search to find factors contributing to this success, the TYC21 Steering Committee identified two factors which seemed most productive. The first factor involved the region's attention to locally defined goals when planning activities or meeting agendas. The second factor concerned the implementation of one or more regional resources impacting communication and the logistics in hosting local activities.

Reporting Regional Goals

In preparation for the April Meeting the program chairs asked each region to formulate goals for the next three years and come prepared to report them during the April Meeting. At the conclusion of National Meeting Three it was

clear that some regions had already defined goals while other regions were scheduling meetings in advance with no particular vision or theme in mind. Special time was assigned during Saturday morning of the April Meeting for regions to prepare posters reporting their goals and other relevant information. The posters were taped on the walls of the main meeting room, lending themselves to discussion throughout the weekend meeting. In addition, one hour of viewing time was allocated for all participants to review posters and discuss the regionally defined goals.

Eleven regions prepared posters for display. The reported goals addressed five topics:

1. physics pedagogy (8 regions)
2. outreach/expanding the network (10 regions)
3. improved communication (6 regions)
4. funding (1 region)
5. dissemination of pedagogical ideas and materials (1 region)

Physics pedagogy ranged from the sharing of curricular materials developed by regional participants to a region-wide focus on a particular topic in introductory physics (e.g.. waves) or pedagogical tool (e.g.. assessment) to a regional focus on the application of physics education research.

Most regions expressed recognition that the TYC community needs to establish outreach and partnerships with the other members of the science community from elementary school teachers to four year college/university professors in physics and engineering to colleagues in industry/workplace and even to college students. Five regions specifically had goals addressing outreach to precollege faculty and students. Five regions had specific goals addressing the engineering community and the technical workplace. Three regions, not surprisingly because of the sophistication of computer technology in their geographic locations, proposed an outreach to college students' via listservs, web pages, and chat rooms. Two regions explicitly defined outreach with local AAPT sections as a goal.

Improved communication was a common goal for six regions. In most cases, the communication was targeting the area designated within the TYC21-defined regional boundaries. In every case, the regions reported that they were attempting to improve the use of electronic communication, and in a couple of cases, local leaders reported the continuation of the publication of regional newsletters.

In addition, three regions reported that members were going to devote time to the dissemination of curricular ideas and materials. One region reported that its members were going to focus on funding sources for local activities during the next year.

Implementing Regional Resources

The TYC21 Steering Committee, during the Fall, 1998, identified five resources which seemed to positively impact the regional collaborations. (It is interesting to note that the impact of the resources had been previously realized by the regions to the extent that some resources were designated as regional goals spanning the next two years.) A panel of six regional leaders during Session 2 - "Focus on the Regions", introduced the weekend's activities addressing regional resources (see Reports from Panel Discussion).

1. Meeting Infrastructure: Todd Leif, Region 7, and Bill Hogan, Region 8, described changes in their meeting modules and the realized needs which led to these changes. Leif reported that his region had not really had a "successful" meeting for a year due to the large geographic area encompassed by the region. The core of members, he reported, are primarily concentrated in Kansas. Hogan similarly reported that core members for his region were concentrated within a 2.5 hour car ride from Chicago. Both panelists reported that regional focus will be made on the quality of the meetings rather than the number of faculty attending. Leif mentioned that his region will explore multiple mini meetings of maybe four faculty each. Hogan reported that their aim was to keep meetings simple and small, also, with the program addressing only one topic, such as waves. In arguing that size was not necessarily a weakness, Hogan pointed out the need for regions to make mistakes in order to ultimately realize growth.

2. Local Funding: A resource often cited as posing a barrier of isolation is funding. Ali Yazdi, Region 11, reported how his region was successfully addressing the need for financial support. The rotation among TYC site hosts helped procure funding from regional colleges. In addition, members contributed support by paying small registration fees and paying for one meal during the meetings.

3. Regional Theme: A single theme for regional activities was reported by Ken Gentili, Region 3, as a resource contributing to his region's success. All members of the region were engaged in a project addressing assessment. The region wide project has been ongoing during the region's lifetime in TYC21. In addition, the region has used this theme to involve Region 9 in cross-regional collaboration.

4. Region-wide Communication: Myron Mann, Region 1, and Tim Dave, in neighboring Region 2, described the communication vehicles lending themselves as valuable resources to the regions. Mann has been publishing a regional newsletter twice a year for approximately 250 readers including TYC colleagues, college administration and the AAPT national office. The region views the newsletter as a strong communication because it is "better than a letter" and reaches a larger audience than e-mail which only goes out to 30 names. Region 2, on the other hand, has found that electronic communication is most effective for them and has, as Dave puts it, "instituted the region". The Region 2 list serv has been widely used in the exchange of information and ideas and was even used in the planning of the region's last meeting. Dave recommends the use of the electronic bulletin board when trying to transmit or receive pedagogical information. He feels that this venue is psychologically better because users seek or transmit the information on their own time and the information is stored at one location waiting for access. Dave also announced plans by his region to use a local TYC phone conferencing center which is free.

Follow-up discussions and exchange of ideas occurred informally throughout the two day meeting. Participants were encouraged to record new ideas or new strategies for regional resources on post-its and attach these to the regional posters on display around the meeting room. The participants also reported the results of their discussions on the internal evaluation forms prepared for the April Meeting. The list below records the resources indicated on these two reports.

Resources to Explore

- improved e-communication (bulletin board, list serv, web page, chat room)
- newsletter
- field trips/alternate meeting sites
- outreach to high schools
- single topic meetings
- local support
- cross-regional activities
- new topics for meetings (conceptual physics course, new course for elementary education majors, under-prepared students)
- industrial connection
- preparation for meetings between meetings

The resources most often reported on poster post-its for future regional discussion were (1) electronic communication, especially the bulletin board; (2) smaller group activities; (3) single topic meetings; and (4) regional field

trips/meeting sites not at TYCs. Similarly, the resources most often reported on the internal evaluation forms were (1) electronic communication, especially the bulletin board; (2) smaller group activities; and (3) the initiation or re-establishment of a local newsletter.

Another stimulus for the exchange of ideas regarding regional resources were activities addressing Meeting Focus Three. (Refer to the narrative for Focus Three activities for further description.)

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Focus One: Reports from Panel Discussion

Panelists: Ali Yazdi, Jefferson State Community College; Todd Leif, Cloud County Community College; Ken Gentili, Tacoma Community College; Myron Mann, Los Angeles Valley College; Bill Hogan, Joliet Junior College; Tim Dave, Solano Community College

Todd Leif:

Region 7, because of its vast distances has continued to have trouble getting large numbers at its meetings. We have found that if we have a "big" speaker or theme to our meetings we do much better than a general sharing session. We have a solid group of Kansas City instructors whom have fall meetings and will continue to do so. They invite the whole region but don't really expect much from outside their own little area. The outstate Kansas Area has also a pretty good group who will get together, including a couple of people from Oklahoma, and a couple of people in Nebraska. Our efforts in Arkansas have been worthless. We tried to piggyback on the AOK section meeting when it was at Russellville Ark and our only two year college people at the meeting were from Kansas, all three of them. We will still try and use the AOK and hopefully our representatives from each state will try and work with the local AAPT group to have a breakout session for the TYC's. As for now, we feel we have identified the people who will attend meetings and work on projects. Many of these are people who have been connected because of the TYC Workshop project and have remained in contact with each other because of the TYC 21 project. We have all ready began our efforts to bring HS teachers into our network and also

four year private schools into the group. Region 7 crossed those boundaries with the last meeting at Pratt CC on April 17. We had 4 high school people attend, they were a part of our memberships high school alliance groups, and we had a 4 year private college physics teacher also come. This is something that I see as being a great benefit to our region because of the opportunities to collaborate on grants, etc.

Ali Yazdi: My remarks was basically about how to keep the regional meetings alive and running as far as the finances are concerned. I mentioned that currently what we are doing is to charge the participants for one meal a moderate \$15 to \$20 and also get the administration of the host college to help out with some other costs. It is useful to rotate the location so that one college does not end up paying for all of the meetings. We had a successful Spring 99 meeting in Mississippi April 16-17, and our Fall 99 meeting is going to be in Waycross, GA.

Bill Hogan: The two-year college physics teachers of Illinois continue to meet using the organizational structure I described at NM3 in Nebraska. The most recent meeting at Prairie State College in the south suburbs of Chicago used a different format than in the past by focusing on one topic area of introductory physics (Waves) and participants seemed pleased with this new format. The next meeting is in the fall at Illinois Central College in Peoria and the sites for several meetings beyond that are already lined up.

The group is not a direct continuation of Region 8 of TYC21 because it is smaller geographically. Region 8 included the entire state of Illinois. All of the active participants in region 8 came from schools within a 2.5 hour ride of Chicago. Region 8 repeatedly tried to expand participation to the rest of the state but the current group is not trying to expand geographically at this time. It is my belief that the original 15 regions of TYC21 were arbitrary and groups should evolve naturally from this point on. Our group in Illinois is grateful for the participation of teachers from Peoria, Decatur, and Springfield and will periodically meet closer to these cities but we will not be meeting in the far western or southern parts of the state in the foreseeable future.

Our group is currently small with about 15 regular active participants. I believe this is not necessarily a weakness. Our meetings have been improving in quality by trial and error. I think the freedom to make necessary mistakes might be lost with a larger group. I hope we will soon reach the level of quality in our meetings that will attract more participants and cause those new participants to become active regulars. It may be for the best that some of our less interesting meetings have not been witnessed by large crowds.

Myron Mann: Twice each year since Winter '97 we have sent out about 250 newsletters to Region One physics instructors. The newsletter serves to announce our meetings, report on past meetings, and to publicize AAPT activities and other physics teaching related events. I also use it to communicate with my college administration as well as the co-P.I.'s and the national office. I asked attendees at our March meeting if they read the newsletter and if they found it useful. 70% answered yes to both questions, but the sample size was too small to be really valid.

We will continue to use the newsletter however, because it is judged to be an effective format for communicating with the region as a whole. It is better than a letter and addressed to a broader audience than our e-mail list of 30 names. It is comprised of articles, goal statements, calendar of events, photos, physics puzzles, etc. It is mailed to the department/division head and (hopefully) distributed to all the physics faculty, full-time and part-time. (I have found on occasion that this distribution did not take place, but I have no back-up plan.)

I am grateful for the assistance of John Altounji (former regional team member) for his assistance in formatting the letter. I also am indebted to John Enger for his talk on the potential of newsletters, given at the Post Falls meeting. All I know about the subject I learned from him!

Ken Gentili: Our region, Region 3, had a distinct advantage at the beginning of the TYC21 project because many faculty members had already been attending our yearly regional Pacific Northwest Association of College Physics conference. We needed to spend less time on "isolation issues." This provided us with the opportunity to develop a theme throughout the project. The results of those efforts, assessing introductory physics classes, was given at the TYC21 retreat in Dallas-Fort Worth.

Input and peer review for this work has been provided by TYC21 Region 9, Ohio State University, Tacoma Community College Faculty and the NSF TIDEE (Transferable Integrated Design Engineering Education) project.

What was presented were:

- Outcomes/competencies for an introductory physics course.
- Categories and performance criteria for critical thinking and problem solving.

The results are generic enough so that they can be used to improve any introductory physics course. The competencies were intentionally developed

around a classification that was not focused on the core of knowledge or subject matter. We felt that each instructor would be able to identify this quite well for their courses, whether it was for a "physics for poets," "a calculus based class," etc. We wanted to establish a little distance from topics so that we could more easily identify what skills we were really trying to develop. We decided that our categories should include critical thinking and problem solving, communication skills, information gathering, and interpersonal skills.

The most important area we felt was in critical thinking and problem solving. We further developed this material and identified categories of competencies and measurable levels of performance. We anticipate that the results can be used to:

- Decide help define our educational goals.
- Understand the success (and failures) in our programs, classes, and activities.
- Evaluate the level of assessment tools.

Thus by setting clear goals that can be assessed, each of us can improve our instructional techniques to maximize student learning in our introductory classes.

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Focus Two: Defining A Community-Wide Vision

Activities addressing Goal Two of the TYC21 Meeting, "A Vision for Tomorrow", began on Saturday with a presentation by Mike Neuschatz of the Education and Employment Statistics Division at the American Institute of Physics (AIP). Mike lead the participants in a discussion concerning the findings of the AIP Report "Physics in the Two-Year Colleges" and the implications the findings have for TYC physics faculty.

The TYC21 project directors felt that the best way to define the role of the national network was to engage the TYC physics faculty as representative leaders of the national community in the discussion and subsequent formulation

of a national vision. During the Saturday afternoon Session 4 following Neuschatz's morning presentation, the directors formed breakout groups and charged them to define the ideas comprising the vision for the TYC physics community for the next three years. At the end of the session each group reported their ideas in bullet format on posters with an oral presentation by each group's self-appointed spokesperson. The five groups collectively produced seventeen ideas for consideration (See Chart 1.)

The session leaders asked participants to study and subsequently prioritize the ideas. Each participant was asked to cast his/her votes for three ideas which they felt should be a part of the Vision by the time of the evening Work Time Session. The TYC faculty informally cast their votes by placing small post-it notes next to three ideas of their choice on the posters which were attached on the walls of the meeting room.

At the beginning of the Work Time Session Saturday evening, a Working Group met to prepare the vision statements encompassing the most important ideas as voted by the TYC physics faculty. The Working Group consisted of five participant volunteers (Tom O'Kuma, Tony Zito, Aaron Wenger, Davene Eyres and Gillian Gabelmann) identified at the close of Session. The charge to the five was the development of a statement of vision and the presentation of their work on Sunday morning.

(A review of Chart 1 shows that ninety votes were cast, which indicates that essentially 100% of the teaching TYC faculty among the meeting's participants casts all their votes. The meeting had thirty-five participants attending; five of these were not teaching faculty). Three ideas of the seventeen clearly received more votes than the others, collectively receiving 46% of the total votes cast.)

During breakfast Sunday morning, session leaders distributed printed copies of the developed vision statement to all meeting participants. Later Sunday morning during Session 7, the Working Group presented the proposed vision to the participants for discussion and editing. Following the incorporation of suggested word changes, the participants, by formal vote, adopted the statements as a Vision for the TYC physics community for the next five years. Immediately following this action, Paul D'Alessandris, Chair of the AAPT Committee on Physics in the Two Year College, called for a vote of the committee members (five of six were in attendance) endorsing the action taken. The motion passed.

The general body of participants also requested, in formal action, that Curt Hieggelke, Member at Large, AAPT Executive Board, report to the Board the

community Vision developed and adopted by the TYC participants with official endorsement from CPTYC.

The internal evaluation for the April Meeting reports that twenty of the thirty-five participants responded to the questions pertaining to this segment of the program. All responses rated the developed vision as realistic for the physics faculty in two year colleges, with 50% of the responses saying that the vision was extremely realistic.

The Vision for the Two-Year College Physics Community, proposed to span the next five years, is printed on the inside of the front cover. This statement complements the Mission for the CPTYC, which is printed on page 17.

CHART 1

NUMBER OF VOTES IDEAS PROPOSED BY BREAKOUT GROUPS

14	Grass roots electronic community
14	Articulate why physics is a necessary course for all students
13	Encourage/expand scholarship
8	Assume national leadership in select areas (technical physics, partnerships in introductory physics)
6	Implement courses for pre-service and in- service elementary education
6	Communicate effective teaching techniques/practices to peers and larger community
5	Maintain national identity to improve student learning
5	Increase professional development opportunities
4	Lead the effort to reform physics education
4	Lead the effort to reform physics education

AAPT Committee on Physics in the Two-Year College Mission

- Provide a common meeting ground and opportunities for communication for two-year college teachers of physics and astronomy.
- Explore topics of professional concern to two-year college teachers, including the framework of conditions and extra-classroom activities that affect the teacher and educational process.
- Cooperate with the High School and Professional Concerns Committees on professional topics of mutual concern.
- Cooperate with the Undergraduate Education Committee on courses and curricula and on matters related to articulation for students transferring between institutions.
- Make recommendations, through the Review Board and Executive Board, to the AAPT Council and membership, for activities that would be helpful to physics education and physics teachers.

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Focus Three: Defining Areas for Community Action

A viable network can only be sustained if the members interacting on a regular basis share a common goal. One way that the TYC21 network can be continued is by identifying persons with an interest in a common problem or situation which can be rectified. During the term of TYC21, those regions that pursued an issue on which the group could focus demonstrated significant growth in forming a working group. Progress toward developing working networks has been slow for several reasons. Two of the most important ones have been identified as: (1) Heavy workloads as faculty members at their home institutions. Tavel found the average teaching load for two-year college faculty was 18 contact hours per week. (2) Many regions had no history of interacting with colleagues in neighboring institutions. None the less many regional participants have put in extra hours working on issues of interest to them.

Since the primary job of two-year college teachers is teaching, it natural that the

primary interest of most two-year college faculty members is to improve learning for their students. Maximizing learning in the classroom requires an understanding of several related elements. Furthermore, developing effective and efficient paths to improved learning requires interaction with colleagues in the broader physics community. Brainstorming, developing, assessing and reporting are necessary elements in the process. Participants in regional activities were asked to consider issues appropriate to improving learning by students in beginning college physics courses. Two related activities during the April meeting formed the vehicle for participants to consider which were the important issues and how those issues might be addressed.

The first activity occurred during the opening session as a brainstorming activity. Prior to the April meeting, participants were asked to read the executive summary of the TIMSS report and come prepared to discuss the implications of this report with two-year college physics faculty. This report was used as a motivator for a session since it suggests that the level of understanding of physics principles of United States students is very low. Therefore, the participants sitting at round tables of eight each were asked to discuss and report a consensus opinion for the following question: "What should we in two-year colleges be doing to help improve learning of our students?" A summary of the table discussions follows:

1. The mathematics and science preparation of pre-service and in-service elementary teachers must be enhanced. Two-year colleges can play a significant role in such a project by offering improved preparation and in-service courses for present and future teachers. We can also serve as mentors to local K-12 teachers.
2. Two-year colleges should take a proactive role in outreach to local area K-12 teachers. Possible activities might include: (A) Adopt a grade school once a week and provide "hands-on" activities for the students. (B) Host star parties for children. Interact with counselors to increase their awareness of the importance of a good math and science foundation. (D) College students could interact with elementary and middle school students by being consultants or mentors. Likewise two-year college physics teachers could serve in a similar role for elementary and middle school teachers.
3. Two-year colleges can begin at "home" by evaluating the effectiveness of our programs and teaching strategies. Then those involved can survey what better schools are doing to affect quality learning. Two-year colleges can also determine how classroom practices differ in other countries from ours, and evaluate if their teaching strategies would be effective for our students.
4. Two-year college physics teachers should model active learning as the

best way to teach under-prepared students.

The group discussions identified five topics to pursue in the follow-up sessions: Future Teachers; Inter-disciplinary Courses/Programs; Under-prepared Students; Physics in the General Populace; Assessment. Participants grouped themselves by selecting the topic in which they had the greatest interest. Each group was asked to recommend actions that should be undertaken to implement the group's ideas. A summary of their reports follows.

Linking Two-Year Colleges and Future Teachers

Michael Neuschatz, American Institute of Physics, suggested during his presentation that many future elementary teachers get their only science education in a two-year college. As a result, we should develop a course or sequence of courses specifically designed for future teachers. The characteristics of such a course(s) should enhance an interest in science, serve as a model for an active learning curriculum and classroom, and serve as a model for colleagues to emulate.

Directions for Interdisciplinary Science

Improved Science, Math, Engineering and Technology (SMET) programs will require continual interaction with industry and with colleagues engaged in similar activity. If such an endeavor is to succeed networking is a necessity. The network (such as TYC21) can serve to disseminate information about appropriate projects, assessment of existing projects, provide name potential project directors and reviewers, etc.

Physics for the General Populace

Two ideas must be addressed, public relations and course content. The general view of physics is negative. It's too hard and not relevant. There is a need to repackage physics, to improve its image through a public relations program. Secondly, the course must allow students to experience phenomena directly. Connections to students' experiences and environment must be developed. Conceptual understanding of the principles underlying the topics being studied should be paramount. However, methods of analysis of data and observations are equally important.

Strategies to Help Under-prepared Students

Once an operational definition has been agreed upon, we should find a reliable way to determine the underlying source of the difficulty. Assessment, curricular materials and student advising are all elements to be included in a successful program to prepare students for a successful experience in physics.

Assessment

As a community two-year college physics faculty lack an understanding of what assessment involves. Assessment seems to mean different things to each person. Different instruments are used to evaluate the various components of the teaching and learning enterprise. Two-year college physics must become familiar with all aspects of assessment.

The first step must be one of education; learning what assessment is, what assessment tools are presently available, how to use existing tools and how to evaluate results. The group also recommends that those interested should work with others to develop pre/post tests in those areas not yet covered by existing instruments. This task would require significant networking with all segments of the physics community. Region 3 should be encouraged to disseminate their work to the rest of the physics community and be encouraged to continue to expand their work. Other regions should volunteer to become involved in the project.

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Internal Evaluation Summary

Evaluation was the final activity of the conference. The internal evaluation asked the participants to reflect on the outcomes of the meeting as they related to one's goals. The internal evaluation focused on regional networking, national networking, and on cross-regional activities. Twenty-four responses were received from the participants.

Regional Networking

The poster session depicting regional activities was a successful undertaking. Over 90% of the respondents reported picking up at least one idea to take back to their region. Ideas were evenly split between ideas to improve communication within the region and ideas to enhance future regional meetings--either format or topical categories.

National Networking

Thirteen respondents indicated that playing a significant role in physics

education at the national level was their highest priority for two-year colleges ranking this item 10 on a 0 (of no significance) to 10 (of utmost important) point scale; and only two people ranked this item below 8. However, when asked how involved in physics education activities beyond their classroom only 25% rated their participation an 8 or higher on the same 10-point scale. When reviewing the examples of activities in which participants are involved, it may be that many under-ranked their level of participation. Most people indicated that most of their involvement was at the local or regional level primarily with TYC21. These data support previously identified dilemmas many two-year college physics teachers face. Namely, they are very dedicated to teaching and learning. However, due to heavy teaching loads and a common problem of finding travel funds, many teachers must forego attending professional meetings.

Perhaps a disconcerting note is suggested in that nearly half of the respondents saw their level of involvement remaining the same for the next two years. The remainder hoped to increase their level of participation during the same time span. Participants indicated a fairly diverse set of interests in which they might become involved. General categories mentioned related to: [a] physics education research - improving the teaching and learning of physics. [b] assessment. [c] outreach to high school and university colleagues, business and industry. [d] increased activity within AAPT and the two-year college community.

One of the activities of the conference was to develop a vision statement designed to provide a direction for the two-year college physics community and to serve as an indication to the greater physics community. Participants feel very positive with the resulting vision statement. Ten people ranked it 10 and the mean was 9.2 on the 10-point scale. Only one person ranked it as low as 7.

Cross-Regional Networking

Participants are somewhat ambivalent on the question, "How important is it that we - the TYC21 community - develop cross-regional activities?" About 40% of the respondents weighted the question an 8 or higher on the same 10-point scale. The mean and mode were 7 and 5 respectively. This assessment is born out by reports of the participants of their cross-regional activity during the last three years. Even with travel funds available to visit other regions, it seems that few Regional Coordinators took advantage of the opportunity. However, some other forms of inter-regional and intra-regional activities have occurred in the form of speakers, workshops and cross-regional projects.

Nearly all of the participants indicated a willingness to participate in a future project which will enhance student learning. Nearly half of the respondents are willing to take a leadership role in such a project.

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External Evaluation Introduction and Executive Summary

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Introduction

This report of the April 1999 A Vision for Tomorrow meeting, supplements the previous external evaluation reports related to the Two Year Colleges in the 21st Century: Breaking Down the Barriers. This project, funded by the National Science Foundation (NSF) through the American Association for Physics Teachers (AAPT), is in a no-cost one year extension phase which will end in February 2000. This time period is being used to solidify the foundations developed over the course of the project. Information reported here reflects observations and data collected from the April 1999 meeting. Attendance was invited, drawn from the pool of TYC21 participants and attendees. This was a smaller group than attended the national meetings and the meeting was unique in character. The majority of participants at the April meeting were involved in TYC21 at some level for the last 4 years and represented the movers among the leaders found via the TYC2I project. The data from this meeting can not be generalized to the entire TYC physics faculty population.

Envisioned in 1993, as a method to address professional isolation among two year college physics faculty and thereby provide improved teaching resources to students, the Two Year Colleges in the 21st Century: Breaking Down the Barriers project reached a momentous juncture at the Vision for Tomorrow meeting held in Fort Worth, Texas in April 1999. The Principle Investigators (PIs) and Steering Committee (SC), drawing on their observations of the project's Regional Coordinators (RC) and regional participants, invited individuals considered to have demonstrated leadership potential to interact with representatives from the AAPT Committee on Physics in the Two Year College

(CPTYC). The purpose of the meeting was to create a vision, statement and mechanism to continue the work; begun by the TYC21 project. In keeping with the goals of the project, first to build a special network of two year college physics faculty and second to train, develop and mentor new leaders to provide a strong voice for the two year college physics community, this meeting to formulate a sustainable vision to focus the TYC physics community commitment evidenced significant progress toward all components of those goals.

This working meeting produced, among other things, a vision statement. The contents of this statement exhibit growth of the community in its own professional expectations, and a clear understanding of the importance of communication. The vision statement reads:

As two year college members of the physics community, we need to actively communicate and promote our belief that physics is an important part of all students' education. Further, we believe that physics teachers who regularly communicate with each other can share ideas and provide a better set of learning opportunities for their students. Our network of physicists will sustain local and national conversations and activities about methods and styles of learning and teaching. These conversations and activities will support scholarship that is widely available, easily accessible and invites comment and collaboration. (April 11, 1999. Fort Worth, Texas)

Building upon the networks and relationships developed over the life of the project, a conference centered on TYC physics issues to precede the annual AAPT meeting was announced and further organized. The goals of the pre-conference are to provide a forum for TYC community and opportunities to network further while moving toward becoming a more integral component of the larger professional body. The April meeting identified actionable ideas to address the current and future concerns of TYC physics education, as well as the broader educational citizenry. These ideas, as well as the work of TYC21 participants, will be more extensively discussed at the preconference.

This 'Vision' meeting provided an appropriate passage for the TYC physics faculty to continue their work; by different vehicles, while implementing what the TYC2 I project produced: a network; of two year college physics faculty. The CPTYC is assuming the mission of continuing the network; and its development, as well as planning to foster new collaborative activities. Having the vision statement as a result of this meeting, the support of AAPT via CPTYC, and the enduring commitment of many of the original TYC2 I

participants strongly suggests the efforts undertaken via this NSF grant have been substantially successful and will be carried on well past the project funding.

Action Areas

A link for Future Teachers

Because many teachers have their only experience with science in a two- year college, we must be proactive in improving the science education of present and future elementary school teachers.

Directions for Interdisciplinary Studies

Science/Math/Engineering/Technology (SMET) education can be improved by developing the interdisciplinary features of the individual fields and creating partnerships with industry.

The Under-prepared Student

A multi-disciplinary effort must be mounted to determine what factors constitute an "under-prepared" student; then, we must determine how we can best serve such students.

Physics and the General Populace

We must promote the perception that physics is an integral part of a liberal arts education.

Assessment

The two-year college community must become more proficient in using assessment tools, which measure the effectiveness of our actions at the classroom, program and college-wide level, through dialogue with colleagues and experts in assessment.

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