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Deciding what should be included in a curriculum has long been a topic of controversy. The struggle to identify what should be taught in schools has been evident throughout the development of American schools (Kliebard, 1995) and continues today. Curriculum debate has endured at least since Plato (360 BCE) first stated his vision that education should produce a balanced, smoothly functioning, and just society. More than a thousand years later, Rousseau (1762) countered with his declaration that the purpose of education was to develop the unique worth and freedom of the individual. John Dewey (1938), taking a more pragmatic position, did not believe that education needed to be an either-or situation. Instead he held that the schools could serve both Rousseau's and Plato's purposes without compromising individual development or sacrificing social balance.

Despite these philosophical debates, career and technical education has been viewed by some as benefiting industry at the expense of the self-development needs of its students. Nobel asserts that private corporations are placing political pressure on the educational system to produce a "cadre of adaptable 'problem solvers' and technicians" (Noble, 1998, p. 269). He notes that this pressure is reminiscent of the political pressure placed on the schools of Dewey's era by the National Association of Manufacturers coalition to force schools to focus on vocational education. The controversy is not limited to curricular theoreticians and political players. In *A Study of Schooling*, Sirotnik (1998) found that parents, teachers, and students could not reach a consensus of what the goal of education should be,

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even when asked to select only between intellectual development, social development, personal development, and vocational development (p. 60).

Given the controversy, it seems unlikely that state or national standards can provide the information required to develop effective curricula. And, if left to educators, how do they develop a career or technical education curriculum that keeps the students from becoming technically adept pawns of corporations? The answer lies in needs assessment. Needs assessment is a powerful tool that can help clarify and validate true needs (Selvadurai & Krashinski, 1989). Since a needs analysis collects information that can be used in making educational decisions (Selvadurai & Krashinski), integrating needs assessment throughout the curriculum development process can help to assure that career and technical programs do not create an either-or situation but rather, as Dewey proposed, benefit both the learners and society.

Practitioners often cringe when they are presented with the prospect of justifying a program with a needs analysis. Why must the assessments be performed? After all, should not the practitioners already know from their own schooling, community contacts, student interactions, and their own critical perspective what is required? In order to address this concern, and before attempting to integrate needs assessment with curriculum development, a basic understanding of the curriculum development process is required.

Developing Curriculum

Posner (1998) suggested that the curriculum development process has "two necessary and complimentary elements: curriculum development technique and curriculum conscience" (p.96). Curriculum development techniques are the "nuts and bolts" processes used to arrive at the curriculum. Models that describe procedures to develop curriculum abound and include Ralph Tyler's "Tyler Rationale", Hilda Taba's "Seven Steps", Decker Walker's "naturalistic mode" (Posner, 1998) and Wiggins and McTighe's "Backward Design" (1998) as just a few frequently cited examples. A curriculum conscience is the ability to understand the implications and consequences of curricular

decisions. Paulo Freire has been referenced as an example of someone bringing a "critical consciousness" to curriculum development (Posner, 1998).

Needs analysis is important for both of these elements of curriculum development. Information about actual needs is required for the procedural development of the program and can also help identify some of the implications and consequences that assist the curriculum designer in making the required value judgments that are part and parcel of the critical consciousness.

The Tyler Rationale is a technique used for curriculum development that identifies fundamental questions that must be answered during the development process (Tyler, 1949, p.1). Since the technique is based on answering questions, and needs analysis helps answer questions, incorporating needs analysis into the process is a natural extension.

The Tyler Rationale is relatively pragmatic and straightforward, and it can be readily applied to career and technical program development. It closes the loop between curriculum development and assessment. Though not necessarily a linear process (Tyler, 1949), this non-linearity allows the developer to adjust the information in each stage of development based on information and decisions made in other stages. This adjustment is important as the information gathered at various stages is used to triangulate the data. It is, however easier to describe the process if it is explained one step at a time.

The curriculum questions Tyler (1949) proposed are

1. What are the purposes or objectives of the program?
2. What experiences are likely to attain these objectives?
3. How can these experiences be effectively organized?
4. How can the effectiveness of learning be evaluated?

The four questions of the Tyler Rationale are still used by curriculum designers and scholars. However, while Tyler proposes pertinent questions, he does not suggest how to obtain

the necessary answers. The following case study illustrates one method used to acquire this information. In this example, a needs analysis answered Tyler's four questions and made it possible to develop a curriculum customized to address a local manufacturer's need for skilled workers.

A Case Study Integrating Needs Assessment into Curriculum Development

As is often the case, the initial thrust to develop a new curriculum came from outside the school. A local fiber optic equipment manufacturer was planning to expand operations. The expansion would require the company to hire a fairly large number of photonics technicians. Photonics is the "technology of generating and harnessing light and other forms of radiant energy whose quantum unit is the photon. . . . The range of applications of photonics extends from energy generation to detection to communications and information processing" (photonics.com/dictionary). The plant manager went to the local college to try to hire technicians and found that the college did not have a photonics program. The perceived need and ensuing political pressure from the industry prompted the faculty to initiate a needs assessment for a photonics program.

The initial step in the assessment process was to answer Tyler's first question: What are the objectives of the program? Photonics was a relatively new field so none of the faculty had expertise in photonics. The faculty first collected data through interviews with people working in the photonics industry. These interviews helped give the faculty an understanding of the photonics field and the education required for photonics technicians. One faculty member also collected data by observing technicians performing their jobs. This provided additional information on the types of tasks performed and the equipment that was required in the field.

Once the faculty had gained a general understanding of the photonics field, a questionnaire was developed to collect data to determine (a) if sufficient need existed in the community to justify implementing a program, (b) the salary levels of technicians to make certain the field would be desirable to incoming students, and (c) the level of education required for the

technicians. The results indicated that there was a need for photonics technicians and the salaries were substantial. The results also revealed that two programs were actually required, one to train high-level electronics/photonics technicians for whom the demand was moderate and isolated to a very few companies, and another to train infrastructure installation technicians for whom there was a high demand spread throughout the commercial community. Both programs were slated for implementation.

The interviews, observations, and questionnaires allowed the faculty to establish a need for the programs, identify the overall objectives of the programs, and provide a fairly strong indication that the careers would be desirable. Next, discussions with focus groups identified specific job duties. The information gathered through the focus groups indicated that there was overlap between the new programs and programs which already existed at the college and at another college. The second college agreed to collaborate by providing courses via distance education media.

With the objectives defined, the developers turned to Tyler's second question: What experiences are likely to attain these objectives? Interviews with faculty in the existing programs at both colleges were held to determine which already-developed learning experiences could be used in the new programs. Documents were reviewed to determine which parts of the existing curricula would apply and to identify gaps that needed to be filled. The faculty then identified and participated in professional development to prepare them to develop and teach the new topics.

The proposed photonics program was to be a combination of on-site courses and distance education courses. Attention shifted to Tyler's third question: How can these experiences be effectively organized? Maintaining appropriate sequencing, continuity, and integration of the curriculum in courses that originated at two different institutions posed a challenge. Faculty worked together to develop a curriculum to fill in the sequencing gaps. To maintain integration and continuity, the faculty decided to set up on-site laboratories for the distance education courses.

At this point the photonics/electronics technician program was put on hold because of a major downturn in the telecommunications market. The actual need for the photonics program, which was pushed politically as having a high priority, failed to materialize. The infrastructure installation training piece of the program was implemented without a distance education component, and the resources from the photonics portion of the program were shifted to it. This was possible because the curriculum developers knew from the needs analysis that the actual demand for a photonics program was questionable, and they had been careful not to commit resources that could only be used for photonics. This is an example of how the information from a needs assessment helped validate and identify true needs.

Tyler's fourth question asks, "How can the effectiveness of learning be evaluated?" Student assessment was integrated into each of the courses to evaluate progress. In order to evaluate the effectiveness of the overall program, an advisory committee was organized to continuously review the infrastructure curriculum. In addition, questionnaires to assess both employer and alumni satisfaction were included as part of the program review process.

Conclusions

Tyler (1949) has provided a framework that identifies the type of information required for curriculum development. This information includes what should be taught, what learning experiences should be used, how these experiences should be organized, and how learning and programs should be evaluated. The framework also recommends that the curriculum development effort be guided by information obtained from industry, the learners, other educators, and society as a whole, but it does not instruct developers on how to obtain the information. Needs analysis techniques provide the mechanisms for collecting the required information. Questionnaires sent to prospective employers can be used to determine if the program is needed. Questionnaires can also be sent to alumni to determine if they are satisfied with their education. Interviews can provide insight into attitudes and views that might impact the educational process. Group processes help explore issues that are

undefined or complex and develop a fuller understanding of a situation. Direct observation allows the study of tasks as they are performed in their natural setting, and document reviews help reduce redundant effort and provide background information into how others have approached similar design efforts.

In order to develop curricula of quality, developers must have valid information on which to base their curricular decisions. The various methods of needs assessment are valuable tools that provide curriculum developers with this information. By incorporating needs assessments in their curricular decisions, curriculum developers can select options that benefit both the learners and society.

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