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Remote Professional Development Opportunities for K-12 Teachers during a Pandemic

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Remote Professional Development Opportunities for K-12 Teachers during a Pandemic

Abstract

While K-12 and post-secondary education have shifted from the face-to-face learning to a virtual or distance learning arrangement in response to the Covid pandemic, teacher training and professional development for K-12 teachers have also been affected. The pandemic caused learning loss not only for the students, but also for the teachers. With schools closed and most everyone in “lockdown”, professional development opportunities for teachers became almost non-existent. This paper will explore pathways for providing professional development for K-12 teachers using different modes of learning.

Continuous professional development for teachers is necessary to ensure that their content knowledge and instructional practices keeps up with the changing base of knowledge and practices needed for effective classroom instruction. Our experience with providing web-based professional development programs for teachers can serve as a model for distance learning programs for teachers, where they can enhance their content knowledge and instructional practices, and also network with others.

Two professional development programs are described that are responsive to teacher isolation from peers during a pandemic. Lessons learned from these programs can serve as a framework for the implementation of teacher professional programs during a pandemic or even after a pandemic.

Introduction

By its very definition, a professional, including a teacher is a lifelong learner because of their association with the knowledge and skills of the profession which keeps growing. Opportunities must be afforded to ensure that the professional keeps learning and developing throughout their professional life. This should be the responsibility of a teacher education system which is more than a mere combination of two of its major components i.e. pre-service teacher preparation and in-service education. Teacher education should be perceived as a continuous process where its pre-service and in-service components are inseparable. Thus, professional preparation and professional development of teachers should be a continuous process.

It is generally accepted that an undergraduate teacher education curriculum provides graduates with the foundation of knowledge and skills necessary to begin practice in their classrooms. However, it is also recognized that there will probably be a continuous expansion of knowledge and an evolution of instructional practices over time. Hence, the first college degree should be just the start of a career-long education process, where continuing teacher education becomes a significant part of the life-long learning process for the teacher. The challenge for the professional development providers is to ensure that the nature, context, and programs keeps up with the changing base of knowledge and practices required for the classroom teachers.

Too many teachers still feel isolated in their classrooms. While many teachers develop and implement new instructional practices or curriculum materials, the ability for them to disseminate or share these developments is severely limited. In addition, there are insufficient opportunities to update or broaden their skills and knowledge. For most teachers, there are more responsibilities than hours in the day. So the professional learning they invest in must fit into their jam-packed schedules—and it must be actionable enough to have an immediate value in the classroom.

Professional Development

Professional development that utilizes a top-down approach by telling teachers what to do and how to do can often be counterproductive and reduce learner engagement and achievement. Successful professional development features a number of key characteristics and components including modeling best practice and opportunities to collaborate. Professional development for teachers is considered a key vehicle for educational reform and improving classroom instructional practice [1], [2]. Professional development is integral to increasing teachers knowledge and skills, and to learning effective application of the skills in the classroom. The planning of professional development programs that can lead to desired teaching practices is not a simple process [3]. Too often, short term teacher training institutes and after school workshops are seen as ends in themselves. These "one shot" approaches to staff development may fail to result in lasting changes in teaching behavior because teachers are not provided with the opportunity to experience success. In addition, staff development efforts have, in many instances, typically focused on isolated instructional behaviors such as cooperative learning, teaching to learning styles, or classroom management skills.

Continuous professional development for teachers is necessary to ensure that their content knowledge and instructional practices keeps up with the changing base of knowledge and practices required in order to maintain effective classroom instructional practices, regardless of the mode of instruction. In addition, teachers should be able to adapt to new technologies for teaching and learning and adapt their instructional practices into remote as well as in-person learning experiences. Teachers need the flexibility of learning, and the direct application to their classroom. Professional development must address the practices of classroom teachers, the design of effective instruction that provides opportunities for developing and improving the knowledge and skills of the teachers, and their ability, when appropriate, to affect changes in their classrooms**.**

Effective instructional practice requires utilization of the outcome-based model [4], [5] which focuses on what students can actually learn and do. The model aligns the specification of learning objectives/outcomes with an assessment that measures the acquisition of those skills and knowledge specified by the learning outcomes, and the classroom experiences that allow this acquisition. A professional development experience should provide teachers with the opportunity to experience such effective instructional practices.

While K-12 and post-secondary education have shifted from the face-to-face learning to a virtual or distance learning setting for student learning, teacher training and professional development for K-12 teachers have also been affected. The pandemic caused learning loss not only for the students, but also for the teachers. With schools closed and most everyone in "lockdown", professional development opportunities for teachers became almost non-existent. Our experience with providing web-based professional development programs for teachers can serve as a model for distance learning programs for teachers, where they can enhance their content knowledge and instructional practices, and also network with others. This paper describes professional development programs that are responsive to teacher isolation from peers through teacher networks, as well as personal time constraints and personal responsibilities. Lessons learned from these programs can serve as a framework for the implementation of teacher professional programs during a pandemic, or even after a pandemic.

Computerized Conferencing System

In the early 1980s, NJIT, in collaboration with Fairleigh Dickinson University, sought to alleviate the issues faced by teachers by creating a computer communications network, as part of a professional development program for initially 35 NJ middle school science teachers [6], [7]. The program included in-person workshops, an electronic communications among the participants, and development, evaluation, and dissemination of curriculum materials via the electronic system. The Electronic Information Exchange System (EIES) [7], based at NJIT, served as an electronic network for teachers that provided for communications between individual teachers via e-mails as well as group discussions via bulletin boards, permanent transcripts for the group discussions, an area for document preparation that could be used for collaborative development, revision, and dissemination of curriculum materials and instructional practice, and a retrieval system that allowed science teachers to contribute to and search for resources from an expanding database.

At the beginning, the in-service workshops were held weekly during the school year, where teachers tested, evaluated, and revised as necessary, new curriculum materials that they then used in their classrooms. The electronic system allowed them to share their classroom experiences with their colleagues. Several years later, collaboration with the NJ Marine Sciences Consortium (NJMC) allowed for the development and dissemination of marine science related curriculum materials. The in-person component was expanded to a one-week "sleep-over" experience at a NJMSC location near the Jersey shore.

A further development saw the teachers bring the outside world into the classroom, where students were able to conduct experiments in environmental topics, such as the measurement of the pH of rain, and discuss topics of interest with students in other locations in NJ and other US states [8]. The program became global when a collaboration was developed with the College of Education at the University of Hawaii created the International Network for Education in Science and Technology (INEST), connecting classrooms in the continental US and Hawaii, Great Britain, Japan, and the South Pacific [9].

The various components of this program were implemented over a period of 10 years while demonstrating a successful network of teacher collaboration that included the involvement of their students in collaborative studies and experiences with students in classes across the US and globally.

Virtual Medibotics

The Virtual Medibotics program was based upon an earlier in-person professional development program funded by NSF. The Medibotics program (Medibotics, the Merging of Medicine, Robotics and Information Technology), was developed as a novel teaching approach, which focused on the development of projects that were medical in origin, enabling the incorporation of information technology (IT), engineering and technology into the physics, biology and mathematics curricula of middle and high school classrooms [10], [11]. The projects were predominantly recreations of robotic surgical procedures that incorporated learning outcomes already required in the teachers' courses. Teachers were trained how to incorporate the Medibotics curriculum into their classroom teaching during an intensive professional development program. The professional development program for teachers was aligned with the factors described by [2], [3]. The program consisted of a two week summer workshop and a one week summer workshop in the following summer. Academic year follow-up included one day workshops and in-class support by university faculty, staff and graduate students during the implementation process in the classroom and program assessment. In addition, a peer-learning electronic community was established, for communications among teachers and university personnel, and for online professional development activities.

Teachers were provided with intensive professional development to train them in how to integrate the pre-engineering curriculum and the robotics kits into their mathematics and science instruction. The professional development included information and hands-on experiences in the Medibotics program to enhance their STEM instruction. The curriculum was developed as a way for students to apply classroom lessons to real-life problems. Teachers also received instruction on how to develop standards-based lesson plans as the curricula is aligned with content standards in science and mathematics.

The Virtual Medibotics project was developed to create and implement a fully on-line professional development program that would enable STEM teachers to access the Medibotics teaching resources online and implement the Medibotics program in their classroom [12]. Through the utilization of the on-line approach, both asynchronous and synchronous delivery options were available to accommodate the range of activities undertaken, including readings, teacher contributions to discussion, and completion of assignments by teachers. Discussion forums allowed teachers to share content, ideas, instructional strategies, and alternative perspectives. As part of the project, teachers implemented and maintained electronic portfolios, that included lesson plans and samples of student work, especially those for "observed classes" either by videotape, through the web, or live. Teachers were also asked to reflect upon their implementation of the lesson plans, describing successes and problem areas that occurred during the implementation. At an appropriate point in time, the lesson plans were moved into a "space" where they were shared with the other participating teachers.

The program was divided into nine sections, each with associated videos, resources, discussion forums, and assignments to be completed by participating teachers. Each video, known as a learning object included notes, reference slides, video, an assessment of learning outcomes for that learning object, and an assessment of the learning object itself unless otherwise noted. Each section included a chapter from a Medibotics workbook and a general discussion forum. Additionally, some sections included supplementary background material. A total of 23 video learning objects were created for this program, eight of which were also revised based on feedback from the teachers.

A learning object may be defined as an entity, either digital or non-digital, that can be used for learning, education, or training [13], [14]. Since learning objects focus on small snippets of information, they are quick and easy to consume, meaning the teacher can still learn alongside their other day to day tasks, without minimum disruption. They can fit it around their busy schedules and complete modules at a time that suits them, from wherever they are. Or they can adopt a fluid learning schedule by choosing which topics they want to tackle when and setting their own pace. This flexibility can help to keep them engaged and support different learning preferences. Also, learning objects can focus solely on practical, action-based content that users may need to perform their job more effectively. Thus, learning objects are any grouping of materials that is structured in a meaningful way and tied to a learning objective or outcome. They should contain the objective/outcome, a learning activity, and an assessment (Rockland, et. al., 2013). Learning objects can vary in terms of size and scope, content, and design. They are usually small units that can be fitted together in different and meaningful ways to provide a customized learning experience. "Fitting together in a meaningful way" implies that the units are related and are arranged in a logical order.

In the professional development program, each learning object included notes, reference slides, video, an assessment of learning outcomes for that learning object, and an assessment of the learning object itself unless otherwise noted. Each section also included a general discussion forum. Since the development and implementation of the learning objects was the primary vehicle to achieve the objectives of this online professional development program, the primary assessment focused on the quality and usefulness of the learning objects. While the teachers found overall that the learning objects were providing the information needed to successfully progress through the online program, they made useful comments that were incorporated in the revisions of the learning objects.

The last section of the program, Capstone Project, is particularly noteworthy. We had found that the best way to determine whether or not a teacher had acquired the skills and knowledge for the concepts in this program was to have them create their own surgeries. These capstone projects require teachers to select a surgical procedure and implement it in their classrooms.

Participating teachers came from locations in New Jersey as well as several surrounding states. The New Jersey teachers represented districts from across the state, thus reaching teachers that could not participate in the face-to-face program because of distance. In addition, the project was able to serve teachers from 5 other states, Maryland, Massachusetts, New Hampshire, Pennsylvania, and Vermont. Thus, the general discussion forum allowed participants to be able to ask questions and share successes and barriers to success with project staff and other participants across NJ and from 5 other states.

Teachers provided comments regarding their experiences in the program by responding to the question: Did the program meet your expectations? If yes, how? Some of the responses are given below.

- Yes in a major way. I did not expect all the other great aspects of the course like the link medical robotics and related fields. I so loved learning the behavioral objectives and how these techniques allow for introducing new information to the students. It help to guide the lesson and kept the students and I focused on a single piece of information so that we were all always on the same page the entire class.
- I found the tasks very challenging and interesting. Some things did take more time than others and were more involved. As I completed each section, I felt a great degree of accomplishment.
- As I progressed through the program, I became more confident that it was something I was going to be able to incorporate in my classes.
- Well, I was pleasantly surprised to see how much guidance I would get in teaching engineering principles along with the techniques for programming.
- Great asset for teachers! I was happy to be a part of it. The remuneration was on par and getting the kit and the camera were a plus. Please keep this up.
- The video clips were very helpful. I also received timely, instructive comments and help. This was a great project to be involved with.
- Please let me know if you will offer more programs like this.
- The response of the NJIT team was generally quite good and the overall outline of the course was fine.   I would have wanted to have more discussion about the total range of design/engineering possibilities with the LEGO components.
- I thought that there would be some more interaction; that is, some actual live discussions to supplement the self-directed work.

Discussion: Lessons Learned

The Computerized Conferencing System was one of several programs developed during the 1980s that demonstrated the ability of establishing an electronic network for teachers to communicate with peers, share ideas, curriculum materials and instructional practices, and collaborate on the development of new materials [[15]. And they were able to participate at a time of their convenience. In addition, teachers were able to communicate with teachers globally, and involve their students in activities with students in other classrooms. While it was a start towards addressing the issue of teacher isolation in their classrooms, it still didn't lead to on-line professional development programs.

Virtual Medibotics provided the demonstration of how professional development could be provided for teachers at their convenience in terms of time and location. As previously described, it provided teachers located in several northeastern and mid-Atlantic states the opportunity to participate in a totally on-line professional development program. The program clearly shows that, contrary to many teachers' beliefs, an in-person program can be transferred to remote learning, utilizing two key ingredients: the outcomes-based model of instruction, and assessments of learning.

Each learning objects included:

- Specification of 1 or more learning outcomes.
- An activity that was aligned with the learning outcome(s).
- An assessment that demonstrated and documented the achievement of the specified learning outcome(s).

As an example, we can look at a teacher's response to the assessment tool for the learning object "Intro to Robotic Surgery"

The Learning Outcome was: "Navigate and identify the structure of a Virtual Medibotics surgery".

For the assessment of the learning outcome, the teacher/student was asked:

1. Write a paragraph that gives an overview of how to utilize the learning objects that relate to a given surgery.
2. Write a paragraph that gives an overview of how to utilize the Medibotics Workbook that relates to a given surgery.

The responses were as follows:

1. A learning object is a tutorial which can be used alone or in combination with other learning objects to complete a surgery. Each learning object has three parts: an introduction to the concept, an overview of programming, and a video of the robot performing the task. A learning object might be needed in different surgeries and so the learning object can be re-visited as needed in order to perform the same function (raise robot arm, e.g.) for a different surgery.
2. More specific information can be obtained from the Medibotics Workbook. The Workbook gives a breakdown of the surgery, building instructions pertinent to the surgery, sample programming, and some advanced options to consider. The Workbook also discusses how the surgery relates to STEM concepts.

According to this assessment, the teacher acquired the specified learning outcome.

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