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Micro-Certification as Professional Development for STEM Educators

The NASA STEM EPDC Badging System

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Educator Professional Development

As the number of workers in science, technology and engineering continue to grow at greater than twice the rate of the growth rate for the total workforce, there is interest in preparing a greater number of students in STEM careers. Preparation in creative, critical thinking, hands-on learning is important to prepare students for such future careers. It is also important to prepare all citizens to be technologically literate and to obtain these important skills as foundations for future learning in any career. Therefore, there is also an increased need for educators who are STEM education savvy.

"The number of workers in S&E occupations grew from about 1.1 million in 1960 to about 5.8 million in 2011. This represents an average annual rate of 3.3%, greater than the 1.5% growth rate for the total workforce."[1]

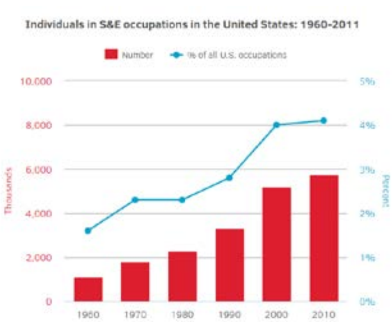

Figure 1: Number of Workers in S&E

Professional Development (PD) for teachers has historically been limited to a locally available menu of choices delivered in the form of didactic workshops offered by school districts, regional centers and conferences. The purpose of these educational sessions are meant to enhance and certify teacher engagement in professional development activities and/or attainment of new skills. The literature is rife with research on this process; however, connections between it and reliable changes in teaching practice that culminate in meaningful learning for students are not consistent (Gamrat, Zimmerman, Dudek & Peck, 2014) and (Wang, Odell, & Schwill, 2008).

Collaborative professional development models outlining conditions for effective PD for teachers include elements of agency, networking, and deep knowledge creation. In addition, there are promising new avenues for the training of teachers when leveraging the use of online offerings such as Massive Open Online Courses [MOOCs] that afford opportunities to meet these conditions.

This paper will provide a brief review of educator professional development programs and advances in digital delivery of such PD from the perspective of the the National Aeronautics and Space Administration (NASA).

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NASA educational program driven by the language in Section 203 (a) (3) of the Space Act, “to provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof, and to enhance public understanding of, and participation in, the Nation’s space program in accordance with the NASA Strategic Plan.”

NASA’s History of Supporting Educator PD

NASA has a long history of engaging the public and students in its missions through educational and outreach activities and programs. NASA’s support for educator professional development began in the early 1960s. At that time, education specialists traveled the country delivering student programs and engaging teachers in direct experience with NASA missions and programs. Over the years, the program expanded to include online workshops, digital broadcast programming and digital badging initiatives. In 2014, NASA’s educator professional development relaunched as the Educator Professional Development Cooperative (EPDC).

Literature/Research – Collaborative PD

Reform-oriented PD includes some empirical evidence that suggests that the collective participation of groups of teachers from the same school, subject, or grade is related both to coherence and active learning opportunities. These, in turn, are related to improvements in teacher knowledge and skill and changes in classroom practice” (Garet, Porter, Desimone, Birman, & Yoon, 2001, p.936). Kearney (2012) reports effective PD supports participant agency by offering multiple options easily connected to workplace and/or professional goals in a climate where teachers try new things without fear of reprisal (Louis, K. S., Kruse, S., & Raywid, M. A., 1996). Professionals respond enthusiastically to exploration of content in collaboration with colleagues (Fuller & Unwin, 2002) and they value shared in-depth study of content and processes relevant to their job assignment and particular interests. Penuel, Fishman, Yamaguchi & Gallagher’s (2007) analysis showed that teachers perform more effectively with results-oriented, collaborative discourse about content and pedagogy within a community of colleagues and experts. When PD is a vehicle for autonomous, professional collegiality grounded in authentic practice it affords professionals’ opportunities to learn new techniques, skills and content.

Anecdotal evidence suggests that roadblocks to this group discourse include inadequate funding to bring in PD providers and facilitators on a regular basis and time to bring all participants together for collaborative sessions. A solution to these impediments lies in the use of digital technologies which allow for PD delivery without travel expenses and asynchronous conversations hosted in chatroom or discussion board formats. Digital badging platforms allow for both solutions to be integrated in an easily accessed location.

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Overview- Micro-certification/ Badging

Digital badging, or simply 'badging', is defined in this paper as a digital, micro-credentialing system used to encourage, acknowledge and document the attainment of knowledge, skills, expertise and dispositions. Professional development badges can range from endorsement of achievement or participation to more thorough, vetted and difficult to achieve (Halavais, 2011) learning efforts.

The goal of the NASA STEM EPDC digital badging system is to provide micro-certification options in STEM learning areas that demonstrate an individual's progress in professional growth in smaller increments than a traditional degree. This allows for greater flexibility in designing an individualized plan for development. Digital badges have been gaining popularity in the world of academia with several universities utilizing them to provide students credit for certification preparation or individual studies. School districts use them to allow teachers to demonstrate the acquisition of specific skills and to obtain professional development credits toward recertification. Micro-credentials are also being used in technical fields to document additional training or skills acquired prior to more formal certifications which may be administered on a set schedule.

From 2015-2017, EPDC hosted 219 online webinar trainings and awarded 1,303 badges which combined to account for over 10, 700 hours of professional development credit.

Traditionally, digital badges are intended to allow individually paced study with submission of evidence to be reviewed by field experts who give feedback and either approve or request modifications. Given that any person or institution may issue micro-credentials, there are no set rules for the type of evidence, length of time to complete, amount of time to complete or rigor of review. This leads to a dilemma for many would-be micro-credential earners as to which badges they should attempt to earn and which will be accepted by their place of employment. In some cases, an employer will designate specific micro-credential sources as acceptable or provide their own, in-house micro-credentials.

One advantage to the Digital Badging offered through NASA STEM EPDC is the combination of education experts from both the Texas State University and NASA acting as both badge authors and badge evaluators. This combination of NASA's recognition as a leader in STEM innovation and STEM professional development along with Texas State's role as one of the leading producers of new teachers in the country give administrators ample reason to accept the badges earned as value added professional development.

To allow for broader acceptability, many digital badge platforms include the ability to share a link which shows the badge requirements and, with appropriate permissions granted by the badge earner, the actual evidence submissions allowing employers to verify the rigor and quality of the badge.

NASA EPDC Badging Initiative

The NASA EPDC system allows for robust badging content generation using What You See Is What You Get (WYSIWYG) editors. This mobile friendly system is also platform independent - ensuring that users may access their accounts from any device.

All users begin by creating an earner profile within the system using Twitter, Google, or Facebook credentials as the log-in. A system administrator then gives upgraded privileges to badge creators, collaborators and evaluators. Upon subsequent log-ins, users are directed to a dashboard which shows a digest of that user's missions, badges, groups and activity stream in a single page. From the dashboard, users may navigate to an explore screen to search for new badges to earn, a my groups page or a reports page.

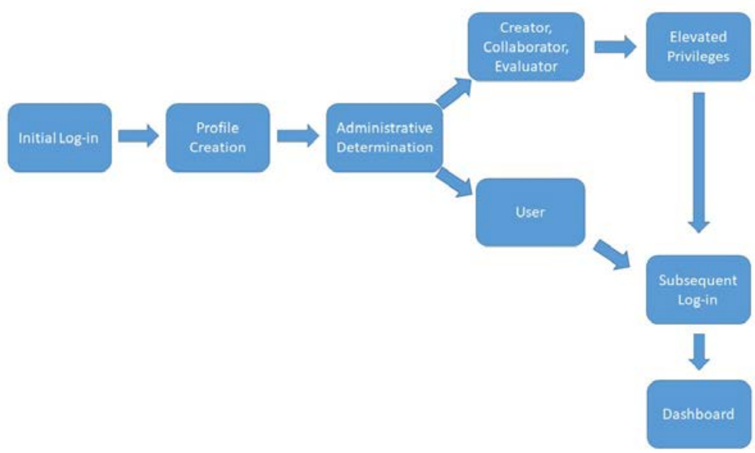

Figure 2: Badge system Log-in Flow chart

Badge creators may initiate new badges and missions, groups of badges around a common theme, from the dashboard page. Each badge has a single author of record with additional collaborators allowed to review and edit and evaluators able to view, comment on and approve or return evidence. Additional collaborators or evaluators are managed by the badge author. Once a badge is in final form, it must be published to lock out additional edits and make the badge visible to potential badge earners. During the publication process, the badge creator determines whether the badge is visible to all users of only to members of a specific group. Badge earners see only the badge author's name associated with the badge regardless of the number of editing collaborators and evaluators.

The explore page allows users to search by keyword, topic, mission, group or author. It also shows recently published badges and suggestions based upon past activity.

On the reports page, badge earners may choose either a brief or detailed report of the badges that they have earned including the category of the badge, hours spent on each and the completion date. For analysis purposes, the reports page allows badge creators to generate multiple reports including badge earners, badge status,

Figure 3: Sample of a badge in Spanish

Figure 4: Learning Profile Report sample from Earner Reports available to all users

badge earner detail and badge evaluator statistics. The badge earner report gives names and completion dates for all badges created while the badge status report shows the number of people bookmarking, starting, completing and abandoning badges. The badge earner detail report allows creators to drill down to the ongoing progress of participants on each step of a specific badge. Badge evaluator reports

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show all assigned evaluators of the badges and numbers of evidence reviewed and approved. Users with elevated privileges also have an evaluation page which shows all submitted evidence awaiting evaluation and an invite page which allows them to manage group and badge invitations.

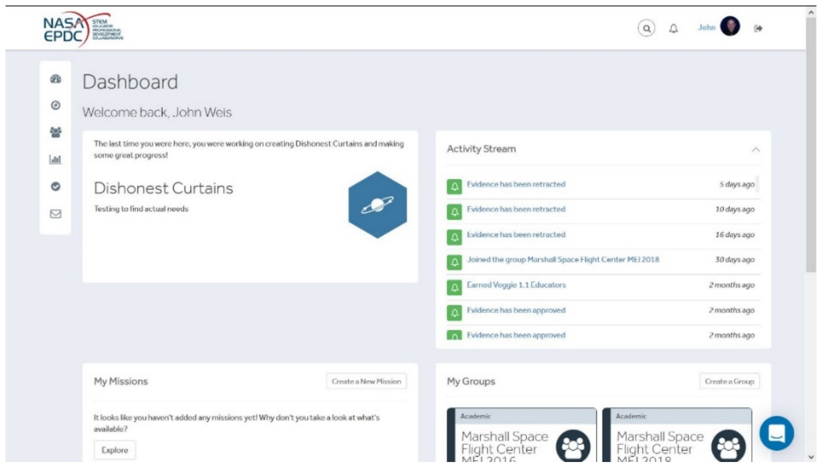

Figure 5: NASA EPDC Badging System Dashboard

NASA EPDC Badging Content – Current and Future Plans

At the time of this paper, there are thirty-three active badges spread across eight topic categories. The topic categorization is informed by the science framework developed by the National Research Council (NRC) of the National Academy of Sciences (National Research Council, 2012). This framework provides a familiar, and evidence based organization structure for science topics, mathematics, STEM instructional practices and NASA contexts.

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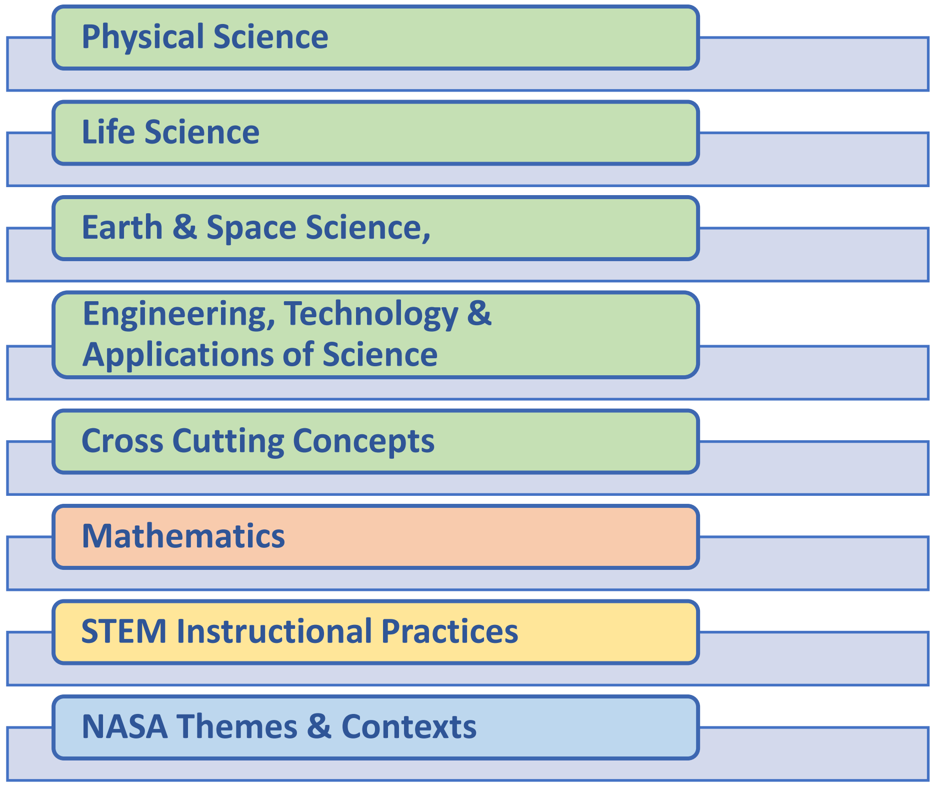
726 badges have been awarded from 27 offerings open to the general public. 1429 badges have been earned as part of a special program for pre-service teachers and professors from minority-serving institutions supported by the EPDC.



In the 2018 NASA strategic plan, NASA lays out the following themes Discover, Explore, Develop and Enable. The EPDC badging system connects the educator to these themes by promoting scientific, exploring NASA initiatives in space, explaining the technologies of tomorrow that NASA promotes, and supporting to develop educator capabilities that will impact their students- the future workforce that will enable NASA to achieve its mission.

For more information about NASA EPDC visit https://www.txstate-epdc.net/.

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